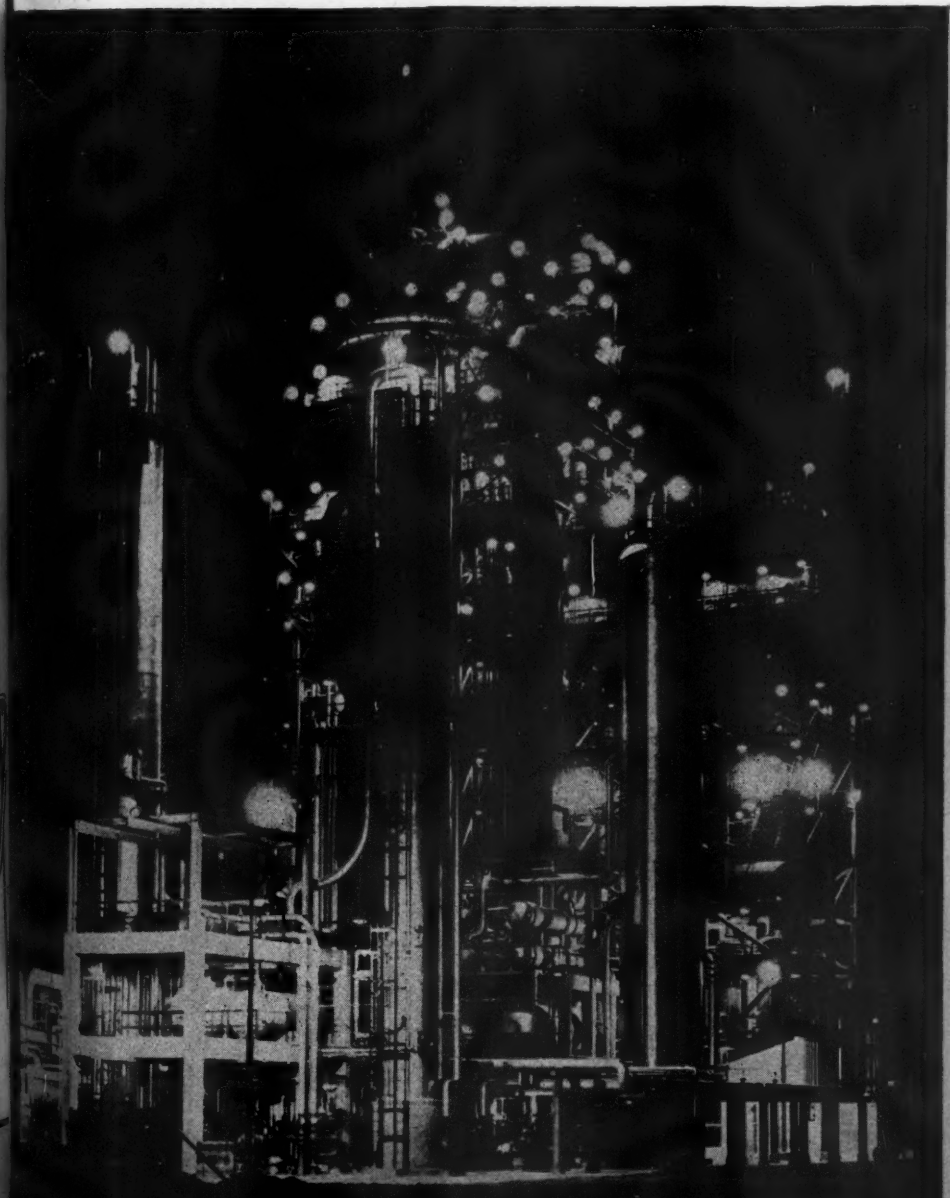
Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION & MAINTENANCE



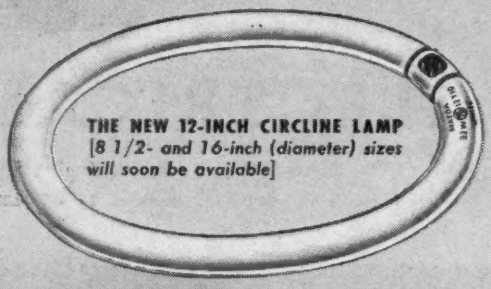
IN THIS ISSUE

. . . Atoms, a new source of energy and power . . . theatre lighting markets and methods . . . how to estimate cellular floor wiring . . . records for controlling electrical maintenance schedules . . . wiring a catalytic cracking plant . . . testing field coils.

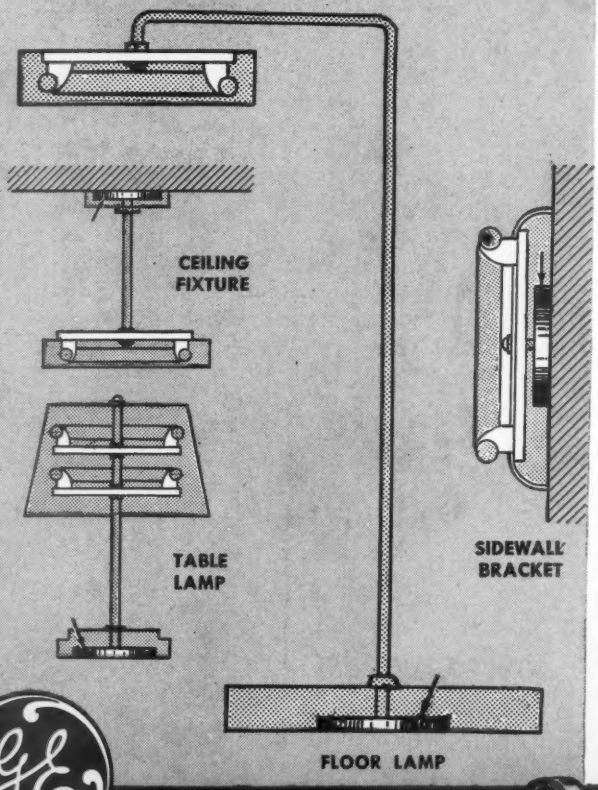
SEPTEMBER • 1945

An Unusual Ballast for an Unusual Lamp





A few suggested applications of ballast and lamp



The disk shape enables you to use the Circline fluorescent lamp to fullest advantage in your new designs

THIS new ballast is functionally designed for easy use in your new portable lamps and decorative lighting fixtures.

The center hole of the ballast facilitates mounting on the stem of portable lamps. The ballast can be easily concealed in lamp bases, or in wall and ceiling fixtures. Connection to the fluorescent lamps is made by threading the ballast leads through the lamp stem.

This ballast is available in uncorrected- or high-power-factor, single-lamp ratings for use on 110- to 125-volt circuits. The uncorrected-power-factor design is 6 inches in diameter and 1 3/8 inches in height. The high-power-factor unit, of the same height, is 7 inches in diameter.

Write today for a copy of Supplement No. 3 to Publication GEA-3293F. It is a "must" for your file of postwar lighting ideas. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

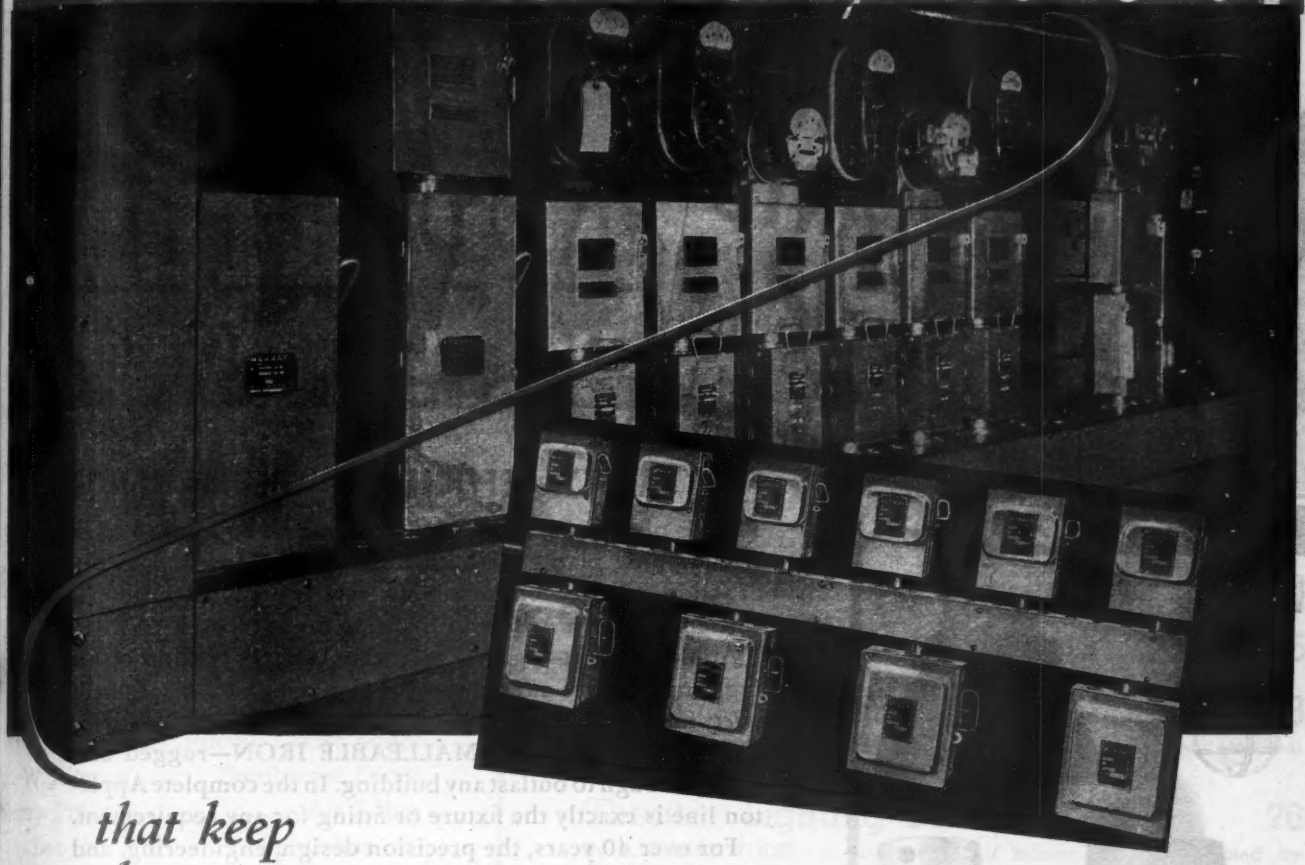


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CABLE
for DEPENDABILITY in fluorescent lighting

Buy all the BONDS you can —and keep all you buy

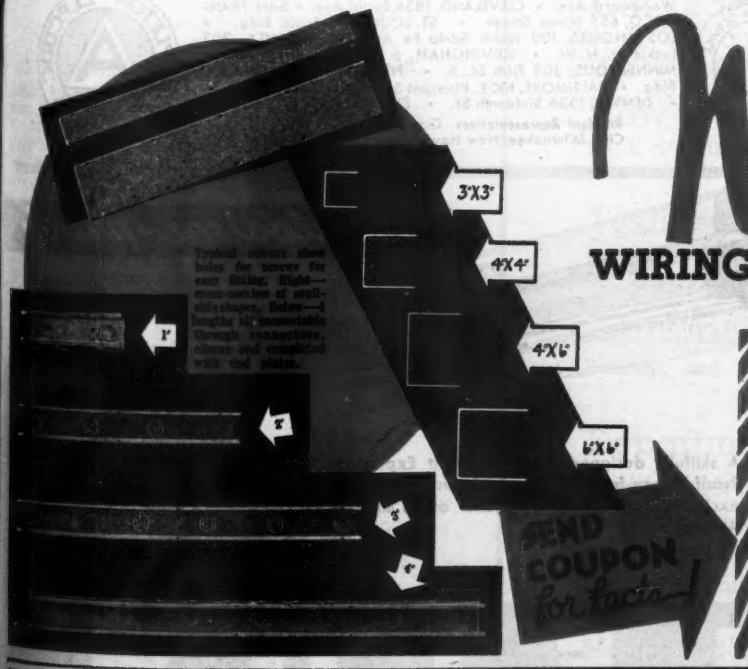
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that keep the
TOUGHEST "GANGS"
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No matter how complicated, how long or how many turns (ever-ready elbows do the trick), Murray Wiring Troughs are easy and quick to install. They are strong and rigid when in place, yet easy to get into, through instantly removable covers. Tap for a branch anywhere—always a knockout handy. Four lengths—and four depth-width combinations. The installations above are typical—and the first you put in will look just as shipshape and prove the easiest job you can remember. Metropolitan Device Corporation, Brooklyn, N. Y.



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Commerce ★★★★ 25
Wed., Aug. 1, 1945

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Electrical Contracting

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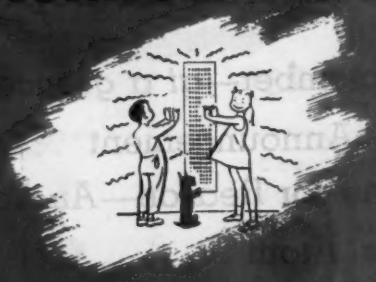
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Head to Heels in comfort . . .



THERMADOR ELECTRIC "HEAD-TO-HEELS" BATHROOM HEATER

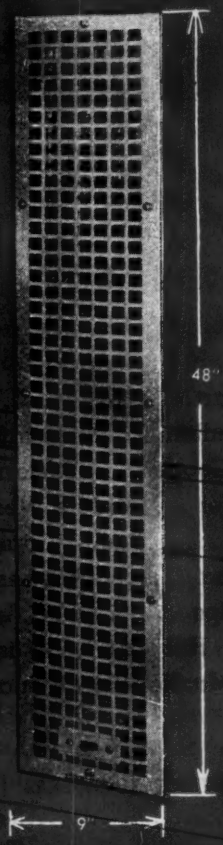
This is the famous **Head-To-Heels** electric bathroom heater.

It's economical to operate, — you can heat your bathroom without using your central heating system.

Needs no flue or vent because it is electric and gives off no fumes — helps you keep your bathroom spotless and shining.

Only 9" wide, its head-to-heels height bathes you in rich, comforting warmth at the flick of a switch.

You and your architect both will appreciate its simple, modern design — the way it can be built into almost any nook of your bathroom. Ideal for new homes or remodeling, and a must in All-Electric Homes.



THERMADOR ELECTRIC FAN-TYPE WALL HEATER

Here is the Thermador Electric Fan-Type Wall Heater.

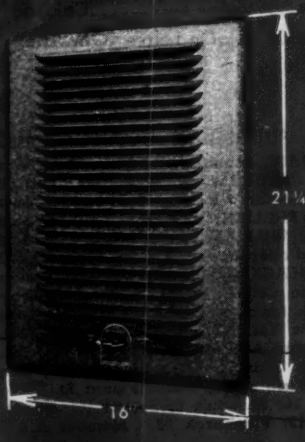
At the flip of the switch or action of the thermostat your room is flooded with clean warmth.

In summer, flip another switch and the fan provides gentle circulation of air.

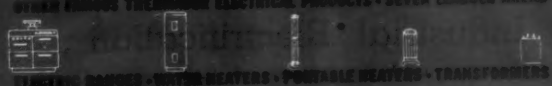
Because Thermador Electric Fan-Type Wall Heaters are flameless, they are also fumeless — do not soil furnishings or drapes.

Thermador Electric Fan-Type Wall Heaters are easily installed, without extra framing, between 16" studs. Your architect and builder will appreciate their sound design as much as you'll enjoy their clean, generous heat.

Thermador Electric Fan-Type Wall Heaters are equipped with a switch to provide full-heat, half-heat and a cool-fan. Thermostatic Control Heaters offer the same features plus a built-in, adjustable special Thermador thermostat that regulates room temperatures automatically.



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What do You Say, Doc?



THE "DOCTOR"— McGarvey Eddleman of Allis-Chalmers Norwood Works— is taking a temperature reading during the heat-run test. It's just one precaution that helps Allis-Chalmers build consistently great motors.

NO—THAT'S NOT a sick motor. Actually it's a very *healthy* one. But that's something we must know — through generous sample testing — before Allis-Chalmers motors can tackle jobs for you.

Part of the "physical exam" that motor at the left must pass is the heat run test. Bristling with thermometers, the motor runs at full load — and speed and temperature are recorded for every hour.

Five or six hours can tell you a lot about a motor's characteristics —but it takes more like five or six *years* to tell you its *character.*

And it's the test of time in which Allis-Chalmers motors have established that they are *great* motors. That's why you hear so many engineers say: "You can depend on Allis-Chalmers Motors!"

• • •

If you could meet and talk with the men who build Allis-Chalmers motors, you might be surprised to learn how keenly they are aware of the big *personal* stake they have in every motor they build for you.

They know that factory tests to fully pre-determine how well a motor is built *just don't exist;* that there's still no substitute for responsible craftsmanship.

And they know that when they build great motors for you they're making *friends*—and that no company and its workers can have too many of them. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 1726

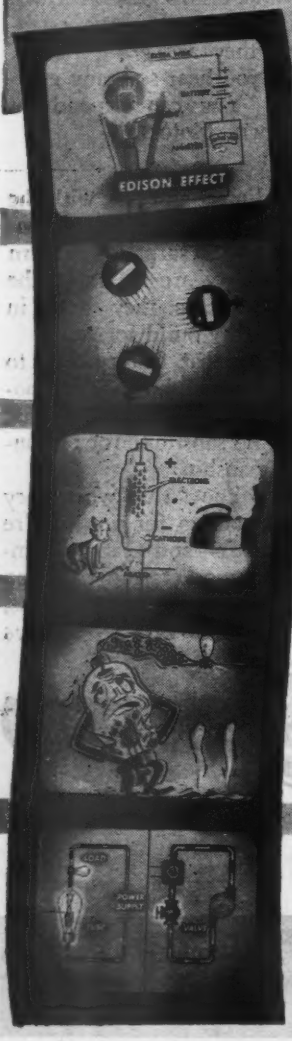


YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

GENERAL ELECTRIC

Announces

A 12-PART TALKING SLIDEFILM COURSE in INDUSTRIAL ELECTRONICS



THESE 5 ILLUSTRATIONS AND (RECORDED) CAPTIONS are typical of the simple, interest-arousing sequences. 100 in each slidefilm.

When the lamp is lighted and the filament glows, current flows through the extra wire, even though it is not connected with the filament itself. This phenomenon (Edison Effect) demonstrates the underlying principle of electronic tubes.

Electrons, being negatively charged particles, repel each other and hinder the flow of other electrons from cathode to anode. This repelling action is called "space-charge"—a factor of very great importance in electronic-tube design.

In some types of electronic tubes, we "boil" the electrons out of the cathode with heat, much as boiling water produces steam.

A gas-filled tube (phanotron) can be damaged if forced to operate before its cathode has been heated sufficiently to emit the required amount of electrons. To prevent such abuses, most electronic equipments have automatic timers built in to protect rectifier tubes.

In our electric circuit, we use a second voltage supply called the control, or grid, voltage. It performs much the same function as the control handle on the valve in a hydraulic circuit.

. . . visualized for easy understanding, even by non-technical people

. . . packaged for easy instruction, using your own "home-talent" leaders

. . . practical up-to-the-minute subject matter, technically authentic

Now, an understanding of electronics as applied in industry can be built up, right within your organization, using the ingenious techniques of *visual instruction* that have proved so successful for wartime training. Every sequence of this 12-part course has been put to test on groups of widely different education levels. Educators have joined practical plant executives in praising its combination of *easy understanding* and *technical accuracy*.

As you follow the instruction manual, the sessions almost "conduct themselves," so that no great experience in organizing or instructing people is necessary. Everything essential is furnished except a sound slidefilm projector (35 mm, 33⅓ rpm), screen, and a meeting place. Upon completion of the course, your people will have a well-rounded acquaintance with electronic devices, tubes, circuits, and applications.



ALL THESE WILL BENEFIT

As electronic apparatus is applied more and more widely to industrial plants and processes, more and more of your people—from managers to maintenance men—will find their work depending upon electronics in a very practical way. Some of them must learn to service this equipment. Others will be better equipped to get the most out of electronic equipment when it is no longer "all a mystery" to them.

PLANT ELECTRICIANS and maintenance men will find the course understandable, even if their knowledge of electrical theory is limited. In learning about electronics and its application, they'll get a background of fundamentals of electricity, too.

PLANT AND DESIGNING ENGINEERS will find the course stimulating in suggesting practical electronic applications to improve processes or products.

PRODUCTION MANAGERS and foremen will get a clearer concept of the workings of equipment for which they are responsible. New process control ideas may also be suggested.

EXECUTIVE MANAGEMENT and purchasing agents can get a clearer concept of practical electronic possibilities. They will be in a better position to consider and approve recommendations.

SALESMEN selling electronic products will be better equipped to talk to their customers.

Note: *ELECTRICAL UTILITY COMPANIES* and electrical associations in many communities are organizing inter-company groups for this course of instruction. You may want to check with your local utility on this point.

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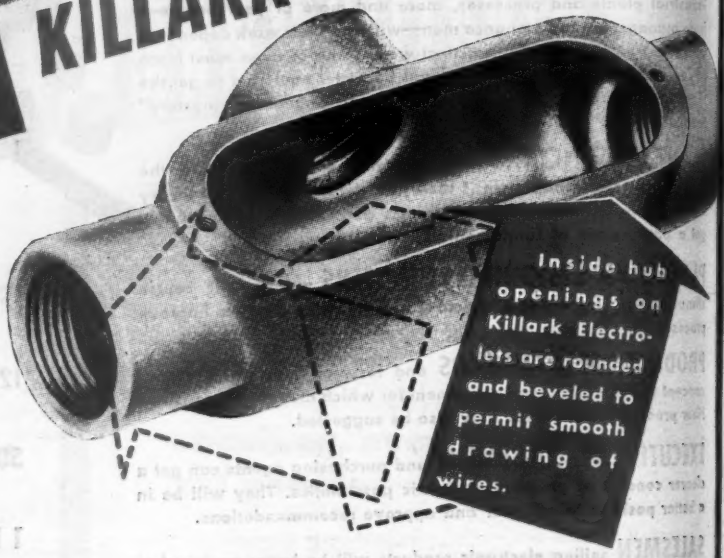
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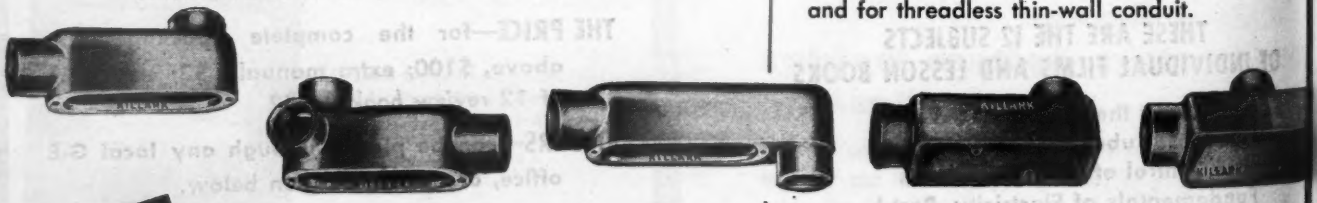
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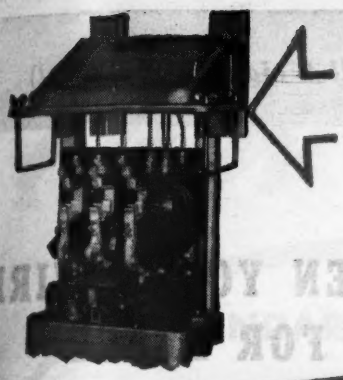
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If you have a problem of finding insulated cable or wire that will withstand severe conditions, such as contact with oil, Flamenol may very likely be the answer. It has proved its many desirable properties in hundreds of power and lighting applications.

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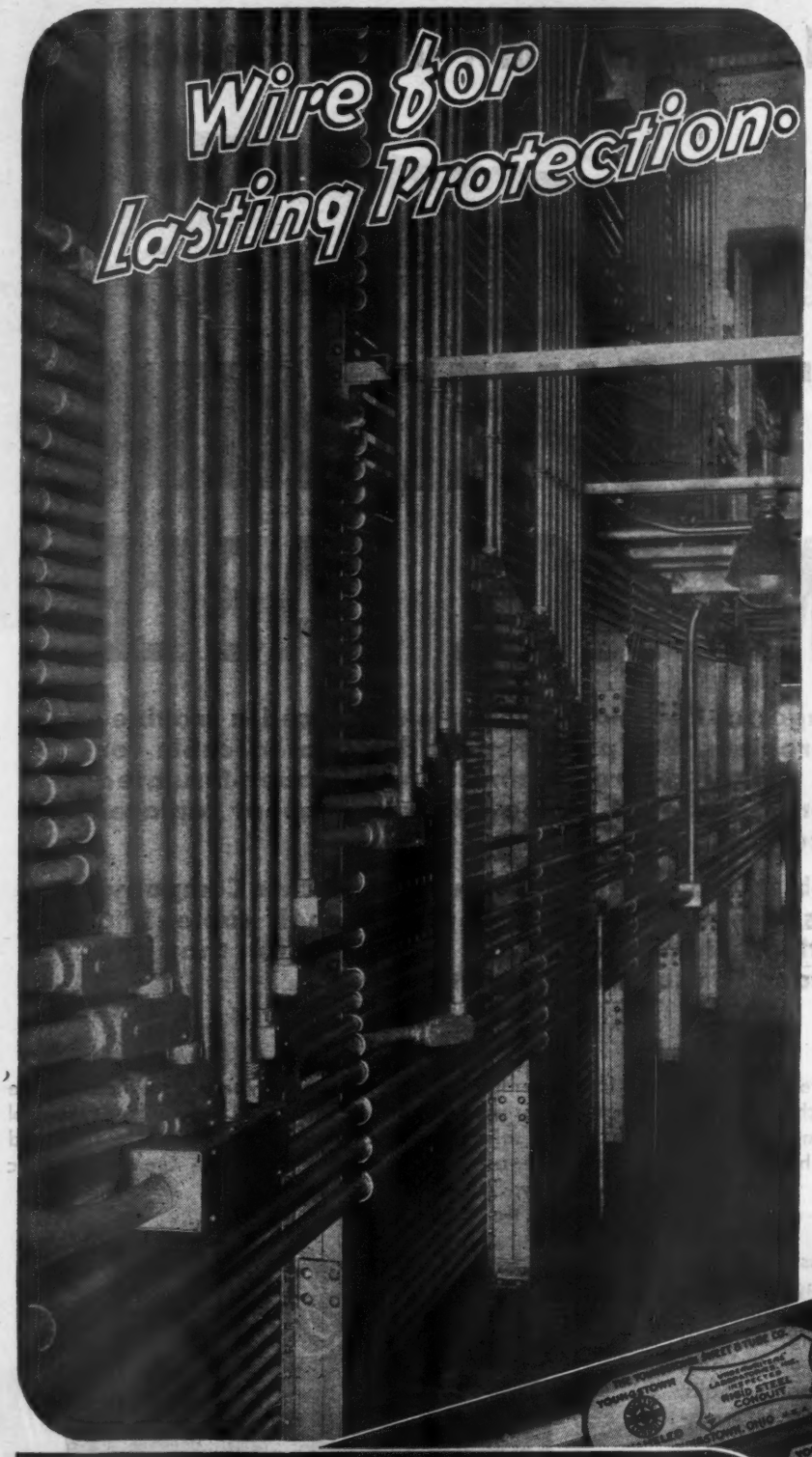


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FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



WHEN YOU REWIRE FOR PEACE

MUCH of America's wartime construction has been built on strictly an emergency basis--good enough "for the duration" perhaps, but questionably adequate for the long term. This fact, combined with the tremendous need of steel for other war uses, has been used to justify relaxation of the high standards of the National Electrical Code for the protection of electrical wiring.

Fortunately, the end of makeshift methods forced on us by war emergency is in sight. Steel will be available again in unlimited quantities. You can again use full-weight rigid steel conduit wherever you wish to provide dependable protection--especially in hazardous locations and occupancies -against moisture, vapors, dust, and explosions.

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STANDARD 2000-HP TRI CLAD MOTORS NOW AVAILABLE

THEY GIVE EXTRA PROTECTION 3 ways

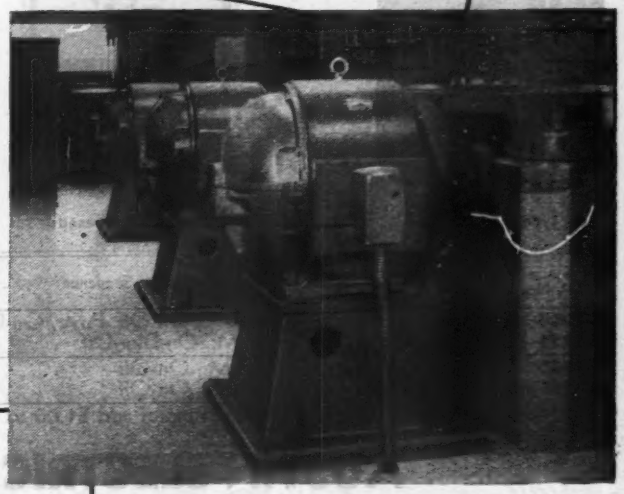
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2 Extra protection from electrical breakdown—Windings of Formex* wire, strongly bonded with oil- and moisture-resistant synthetic resins, stand up under abrasion or "heat-shock."

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HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
TRI CLAD Type K	—1 hp to 2000 hp at 1800 rpm
TRI CLAD Type KG (High starting torque, low starting current)	—5 hp to 200 hp at 1800 rpm
TRI CLAD Type KR (High starting torque, high slip)	—Available to 100 hp in speeds required for high-slip, flywheel drive (punch press, etc.)

Buy all the BONDS you can—*and keep all you buy*

GENERAL ELECTRIC



SEND FOR BULLETIN TS-1 LISTING OUR COMPLETE LINE OF TIME SWITCHES

PROMPT SHIPMENT AND NO PRIORITY REQUIRED ON THESE

AUSTIN

POULTRY HOUSE LIGHTING TIME CONTROLS

LOW COST—DEPENDABLE ACCURATE PERFORMANCE—LONG LIFE

TYPE "P" FOR MORNING AND EVENING TIME CONTROL AND AUTOMATIC DIM PERIOD

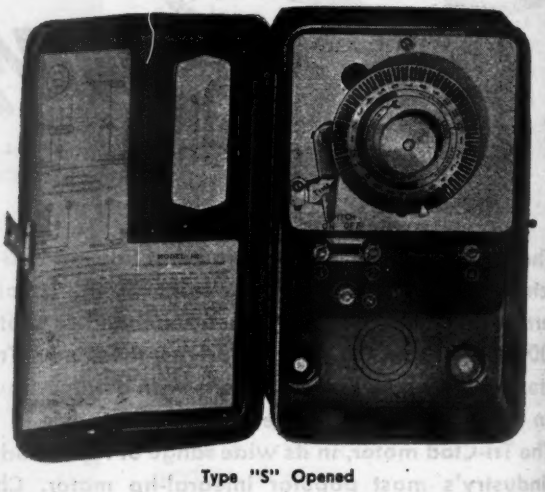


Type "P" Closed



Type "P" Opened

TYPE "S" FOR MORNING TIME CONTROL ONLY WITHOUT DIMMING



Type "S" Opened

Austin Cat. No.	Schedule	Sequence	Watt capacity	Poles	Throw	Volts *Cycles and Current	No. of Trippers Supplied	Approx. Wt. Lbs. Each	List Price, Each
P-1215	Morning and Evening	A.M., On-Off. P.M., On-Dim-Off	1500	1	2	115 V., 60 C., A.C.	4	6¼	$18.50
P-1215-N	Evening only	P.M., On-Dim-Off	1500	1	2	115 V., 60 C., A.C.	2	6¼	18.50
S-1130	Morning only	A.M., On-Off	3000	1	1	115 V., 60 C., A.C.	2	5	13.00
S-1115	Morning only	A.M., On-Off	3000	1	1	230 V., 60 C., A.C.	2	5	14.00

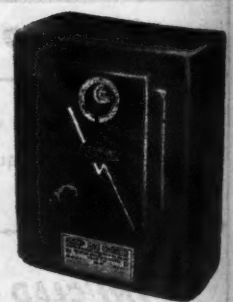
*ADDERS—For 25 cycle synchronous motor add $1.00 to above list prices. No extra charge for 50 cycle motors.

AUSTIN ELECTRIC FENCE CONTROLLERS



No. SB-6 Portable 6-Volt Battery Operated Outdoor Weather-proof Model

Austin Catalog Number	DESCRIPTION	List Price Each
SB-6	Portable, 6 volt battery operated, outdoor, storm-proof unit complete with battery leads and instructions. Equipped with built-in lightning arrester and on-off switch. Size 7" wide x 8" high x 4" deep.	$ 9.95
CSB-6	Portable, 6 volt battery operated. Weather-proof steel enclosure with handle and built-in battery compartment. Equipped with high and low shock terminals, ON-OFF switch, two built-in lightning arresters, ground clamp and installation instructions. Size: 12" long x 6' wide x 9" high.	14.95
DSB-6	6 volt, battery operated. Equipped with short signal light, three-point soil compensator, built-in lightning arrester, ground clamp and double fusing. Size: 10" wide x 13" high x 6" deep.	$19.95
DHL-110	110 volt, A. C. high line model. Equipped with short signal light, three-point soil compensator, built-in lightning arrester, ground clamp, double fusing and automatic safety circuit breaker. Size: 10" wide x 13" high x 6" deep.	26.50
C-6110	Combination 6 volt battery or 110 volt A.C. high line model. For indoor or outdoor use. Equipped with built-in short signal light, battery and high line cordsets, built-in lightning arrester, ground clamp, glass window to check operation and operating instruction. Size: 8' wide x 10¼" high x 4" deep.	21.95



No. C-6110 Combination Model for 6 Volt Battery and 110 Volt high line operation, with built-in signal light.

Send for Dealers' Discount Sheet ***Order from Your Electrical Wholesaler***

THE M. B. AUSTIN COMPANY

108-116 So. DESPLAINES ST. CHICAGO 6, ILL.

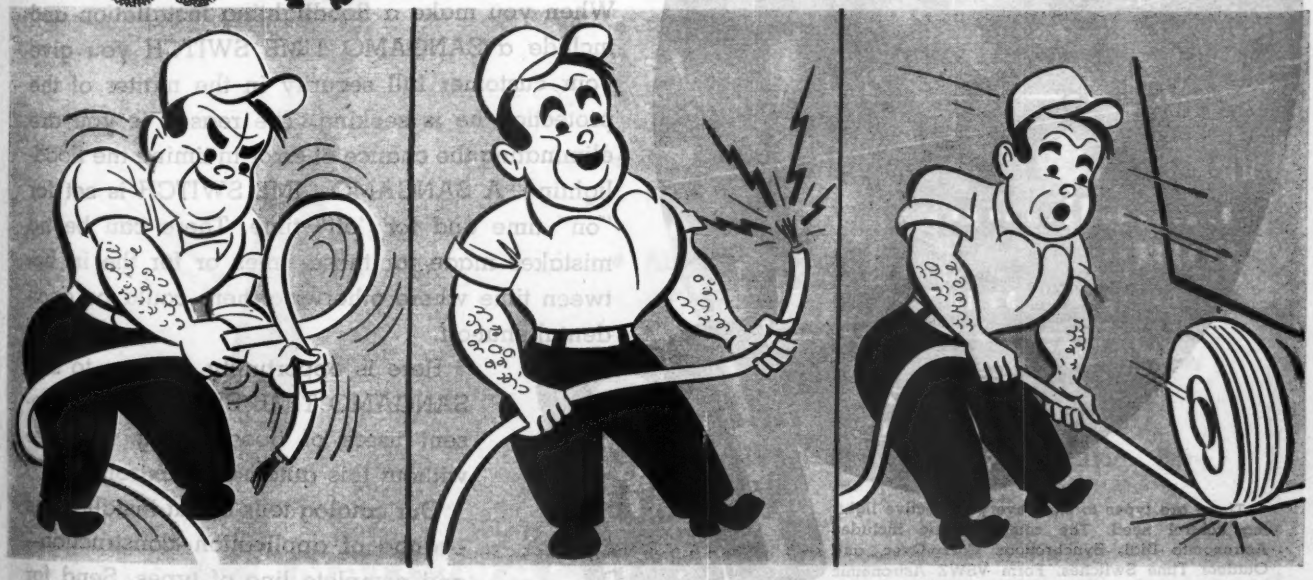
DREADNAUGHT HEAVY DUTY

A TOUGH CABLE FOR TOUGH JOBS



Here's a tough lead-cured cable, constructed especially for heavy-duty portable equipment—welding machines, mining machines, shovels, dredges, cranes, etc. Used to transmit electrical power from supply line, as well as distribute that power to machinery and control devices. *Flexible, durable, safe, long-lived—Paranite Dreadnaught* cuts repairs and replacements; delivers current continuously, no matter how tough the job. In single, two, three, and four-conductor cables. Multiple conductors, over four, fabricated for your special requirement. Write for further facts and specifications.

If It's PARANITE It's Right!



FLEXIBILITY

Conductors are multiples of fine strands —for extra flexibility, freedom from kinking, high conductivity.

SAFETY

Insulation is of finest quality—for high dielectric strength, high physical strength, low leakage, long life.

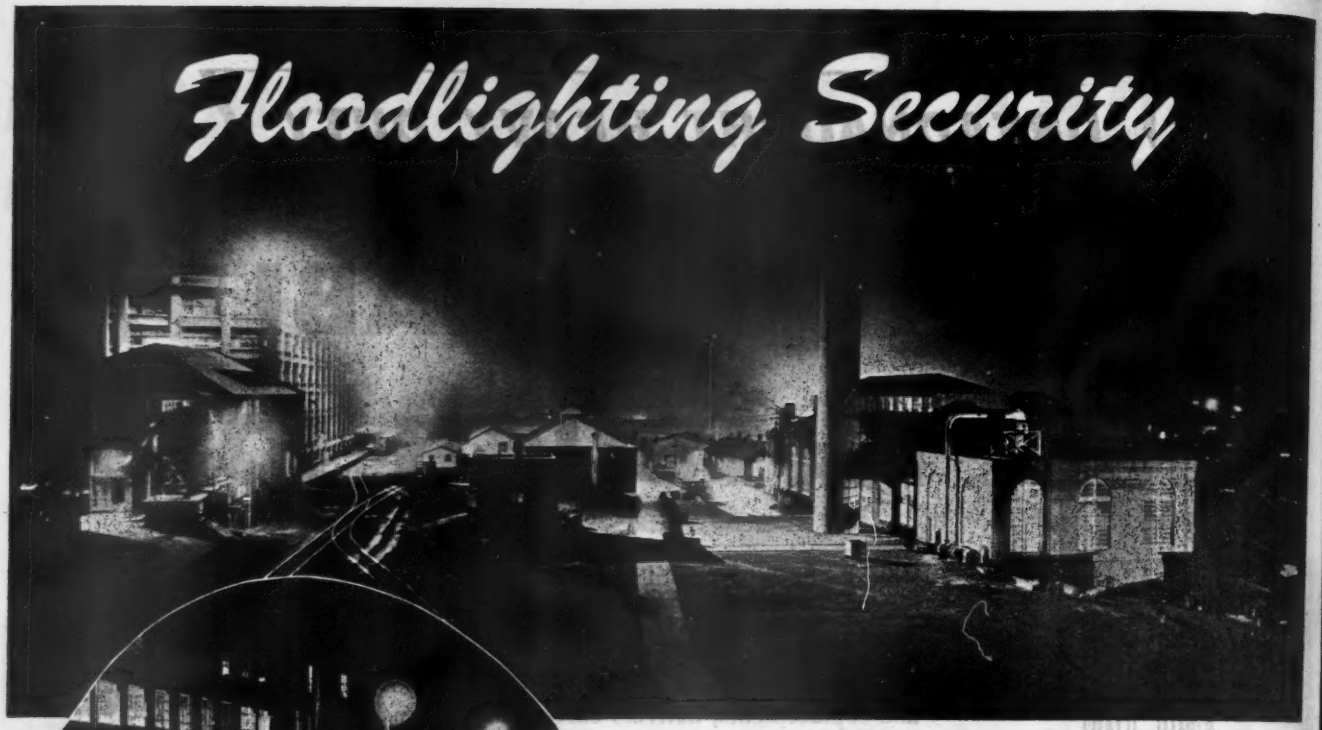
DURABILITY

Jacket is lead-cured, abrasion-resistant; flexible, too, yet exceptionally strong and durable.

PARANITE WIRE AND CABLE
Division of ESSEX WIRE CORPORATION
FORT WAYNE 6, INDIANA

ELECTRICAL WIRES AND CABLES *"BETTER THAN CODE REQUIRES"*

Floodlighting Security







• There are types to meet every protective lighting control need. The complete line includes Astronomic Dial, Synchronous Carry-Over, and Outdoor Time Switches. Form VSWZ Astronomic Dial Time Switch is shown above. Current interruptions up to 10 hours will not stop it nor affect its "on" and "off" settings.

SANGAMO
TIME SWITCHES

When you make a floodlighting installation and include a SANGAMO TIME SWITCH you give your customer full security in the matter of the protection he is seeking. The reason is you are eliminating the chance of error in timing the floodlighting. A SANGAMO TIME SWITCH is set for "on" time and for "off" time. There can be no mistakes made for those times or for the in between time where otherwise there could be accidental shut-off.

Here is opportunity for you to sell SANGAMO TIME SWITCHES to present users of floodlighting who are without this automatic control.

Our catalog tells about installations—range of application—construction—and complete line of types. Send for a copy.

WHERE THERE IS A NEED FOR FLOODLIGHTING···THERE'S A SALE FOR AUTOMATIC CONTROL···

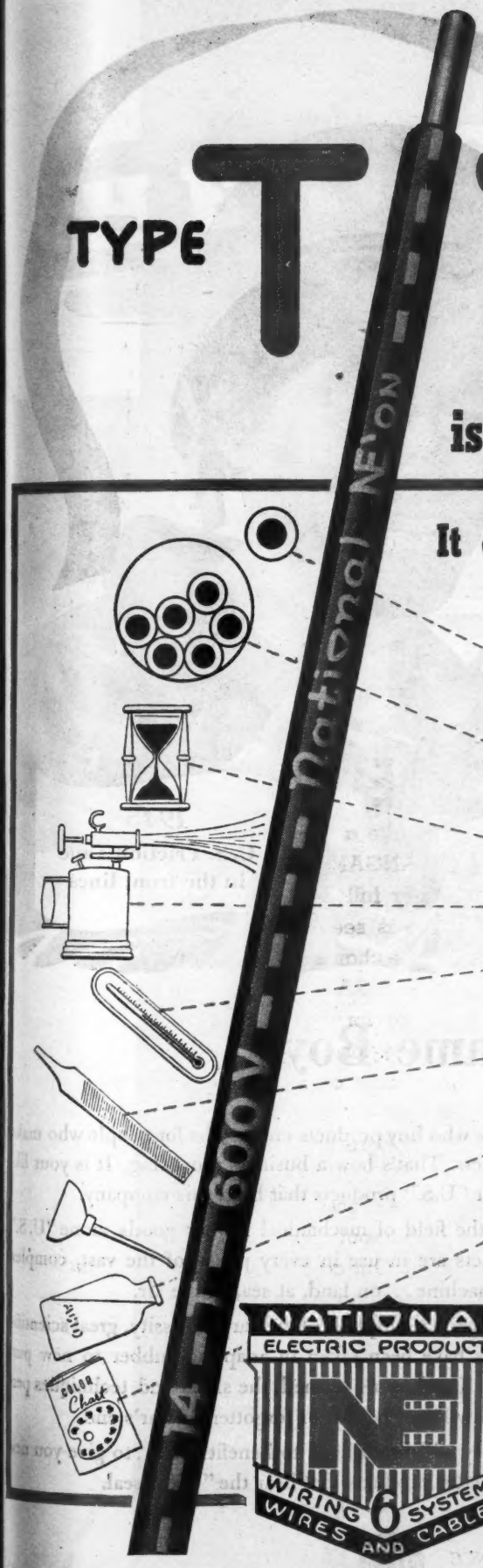


SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

TYPE T NE`ON

(thermo-plastic)

is a superior building wire (600 volts)



It offers these advantages over other types of electrical wiring:

- Superior dielectric properties, permitting minimum diameters.
- Greater number of Type T wires to the conduit, increasing wattage capacity as much as 212%.
- Better aging properties.
- Exceptional flame resistance.
- Approved for operating temperatures up to 60°C (140°F).
- Abrasion resistant—fibrous coverings unnecessary.
- High resistance to most acids and alkalies, alcohol, gasoline, oils and greases.
- Wide color range for easy identification. Permanent colors.



Available in all standard sizes up to 2,000,000 CM. Sizes 14 to 4/0 are approved by Underwriters' Laboratories. And for unusually moist locations, specify National Electric Type TW. Engineering data on request.

National Electric
PRODUCTS CORPORATION
Pittsburgh 22, Pa.



Same tape... same Boy

GIVE an American boy a roll of friction tape and he'll tackle just about any kind of a repair job that comes along... with the odds on his doing it successfully.

When boys like that donned uniform they found their old workbench friend more useful than ever.

Take the men in the Signal Corps, whose resourcefulness in emergencies is legendary. They use a lot of friction tape—from their basic training schools right up to the front line observation posts. And a lot of that tape bears a familiar name—"Holdtite".

Same boy... same tape... made by the same people—United States Rubber Company.

People who buy products create jobs for people who make products. That's how a business grows big. It is your liking for "U.S." products that built this company.

In the field of mechanical rubber goods alone "U.S." products are in use in every phase of the vast, complex war machine... on land, at sea, in the air.

Under the whiplash of military necessity, great scientific strides have been taken in adapting rubber to new purposes. The lessons learned, the skills and techniques perfected will not be lost or forgotten at war's end.

They will be utilized to benefit you... to give you new and better products that bear the "U. S." seal.

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HERE'S PROOF

Leader

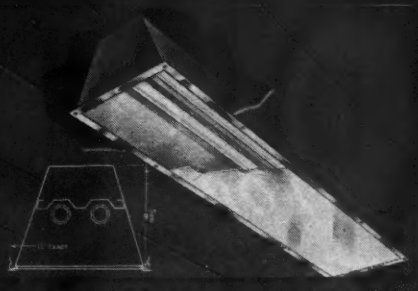
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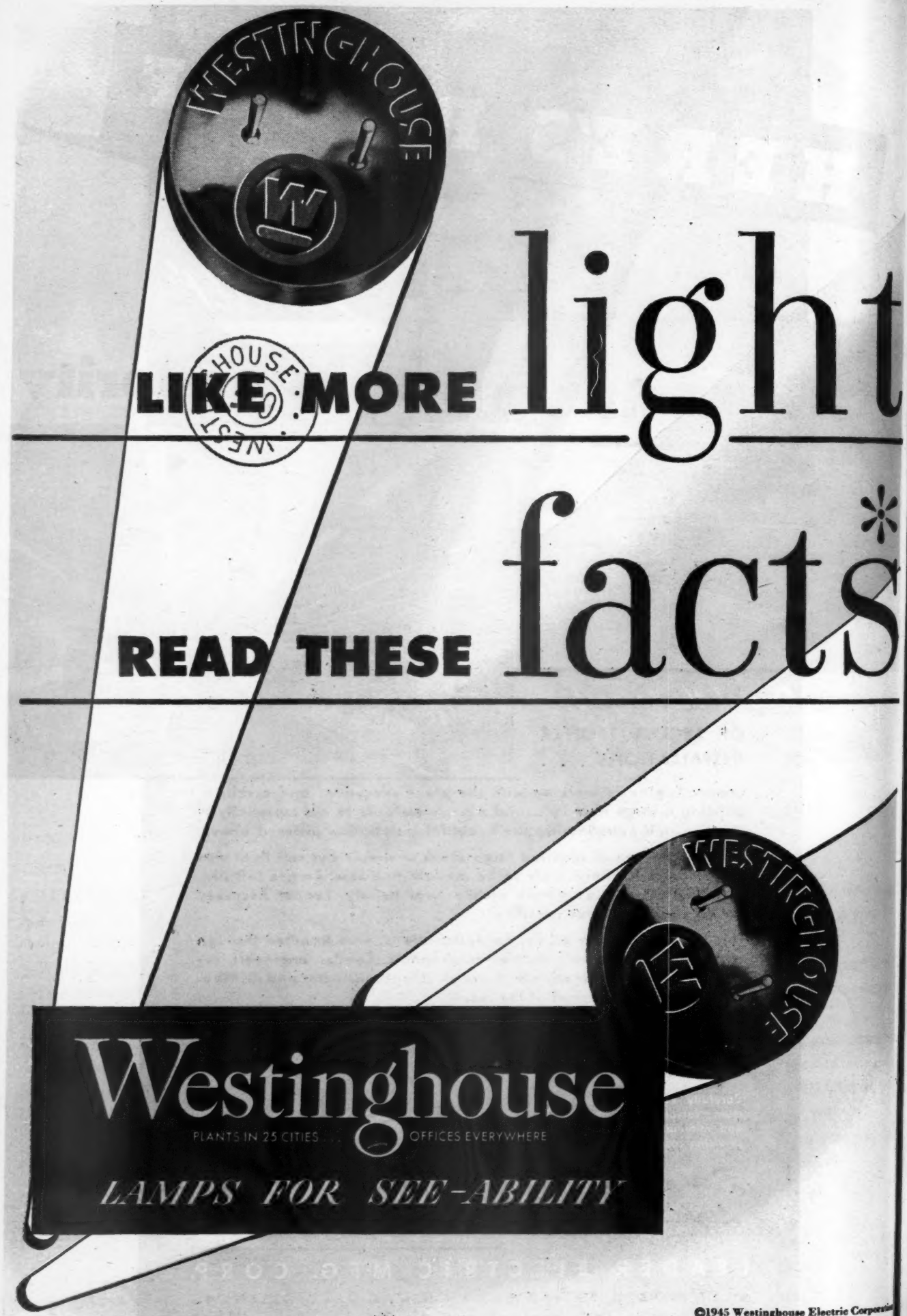


One of the largest

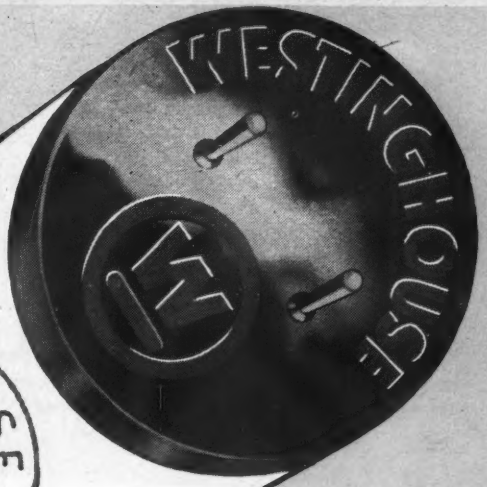
Carefully engineered for maximum versatility in installation and minimum maintenance and servicing cost.



LEADER ELECTRIC MFG. CORP.



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ON LAMPS?

ON FLUORESCENTS

✻ Lamp buyers by the thousands have learned that they can look to Westinghouse for thorough-going lamp satisfaction.

✻ These buyers are hard-headed businessmen — satisfied Westinghouse users in stores, offices, plants and other buildings all over the U. S.

✻ In order to keep these thousands upon thousands of people pleased with Westinghouse Lamps, Westinghouse maintains an elaborate system of testing, checking, inspecting—all the way from raw materials to finished, packaged lamps. This is costly —but pays off in customer satisfaction.

✻ Westinghouse always has maintained year-in, year-out, never-stop research.

✻ Continual improvements in manufacturing technique mean continual improvements in the lamps themselves.

✻ For these reasons, if you want to get the most out of handling lamps, it pays to push Westinghouse Lamps. Westinghouse Electric Corp., Lamp Division, Bloomfield, N. J.

WESTINGHOUSE PRESENTS *John Charles Thomas, Sunday, 2:00 P. M., E. W. T., N. B. C.*
Tune in Ted Malone, Monday through Friday, 11:45 A. M., E. W. T., Blue Network

Better Threads

FOR THE PIPES OF PEACE!

As new construction gets under way... to fill the big backlog of orders for new homes, commercial buildings, new plants and reconversion... do a better job of pipe fitting with TOLEDO Pipe Tools!

Backed by nearly half-a-century's experience... Toledo-Engineered for accurate, easy operation and long-life dependability. Specify TOLEDO to keep your costs down and production UP!

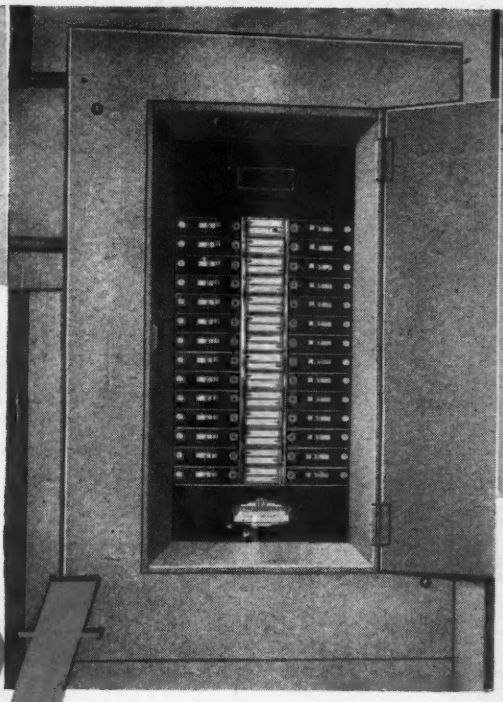


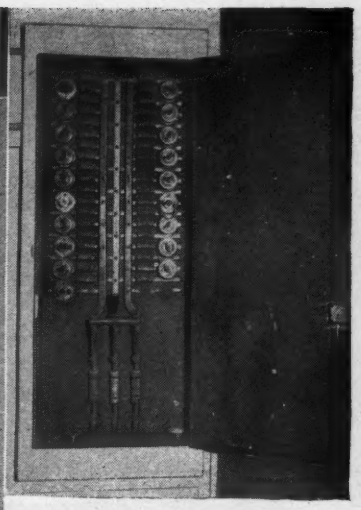
No. 999 2" POWER PIPE MACHINE. Save time, cut costs and do a better job—with this small, compact, portable Toledo Power Pipe Machine. For cutting, threading and reaming up to 2" capacity. It threads 2" pipe in 22 seconds, cuts off 2" pipe in 10 seconds. Smaller sizes relatively fast. Widely used and preferred in shipyards and large war plants. Ideal for production-line speed in new building! The Toledo Pipe Threading Machine Company, Toledo, Ohio. New York Office, No. 2 Rector Street Building.

RELY ON THE LEADER... TOLEDO

FOR PRECISION PIPE TOOLS







(Above) 35 years old, live face, Ⓕ panelboard replaced with (Left) New Ⓕ Dublbrak circuit breaker panelboard; resulting in greatly increased capacity, more safety, plus automatic circuit protection. Installed in original box.

The Right PANELBOARD *is Money in the Bank*

for NEW CONSTRUCTION
for RECONVERSION
for MODERNIZATION

There are many different kinds of panelboards, your problem is to select the right one. Advancements in electric application frequently obsoletes control equipment unless foresight is used in its selection. And this is where we can help you.

Your industry will need thousands of new panelboards for modernization, reconversion and new construction to economically utilize new improvements in electrical equipment. *And there is a standard Ⓕ Panelboard for almost every job.*

★ **DUBLBRAK (NA1B) (Illustrated)**

15 to 30 ampere AC or DC automatic circuit breaker type, with fast double make and break connections.

★ **THERMAG (NAC1B)**

15 to 50 ampere AC circuit breaker type. Dual thermal-magnetic trip with time-lag allowance.

★ **LEADER (LNT1P)**

30 ampere tumbler switch and plug fuse in moulded bakelite, four circuit unit sections.

★ **DUST-TIGHT**

Lighting and Power panels in specially built cabinets for hazardous locations. 15 to 600 amperes, 250 and 600 volts.

★ **NARROW COLUMN**

To fit 8", 9", 10" H columns or the narrow space between windows. Made with Dublbrak or Thermag circuit breakers.

★ **PULFUZSWITCH**

Horsepower rated pull-out type switch. 30 to 100 amperes, 250 volts — 30 to 60 amperes, 575 volts.

★ **KLAMPSWITCHFUZ**

Horsepower rated 30 to 1200 amperes, 250 and 575 volts. Hinged door holds both switch and fuse.

Factories . . Offices . . Stores

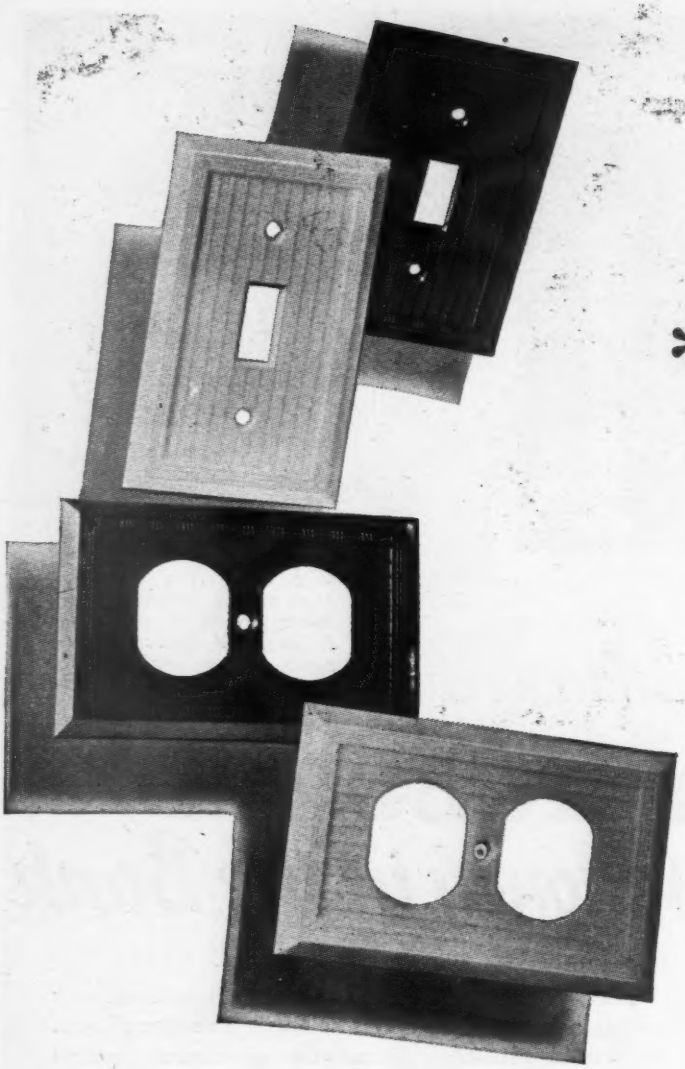
Automatic circuit breaker Panelboards provide unexcelled protection for lighting and small appliance circuits, and materially reduce maintenance costs for all types of large buildings. Small stores, garages and other similar industries find circuit breaker or switch and fuse panelboards equally suitable. Ⓕ Feeder distribution panelboards for industry are assembled with standard units, perhaps of several types, to meet exact requirements. Whatever your requirements may be, our half century of experience devoted exclusively to power distribution and control is at your service.

EST. 1891 — THE SIGN OF A FA BETTER JOB

Frank Adam

ELECTRICAL PRODUCTS

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.



STANDARDIZE ON THE STANDARD *UNILINE TRADE MARK PLATES

. . . with 5-way superiority

- Attractive standardized appearance
- Standard NEMA color tints
- Standardized workmanship and quality
- Full range of types and gangs
- Standard with the electrical wholesaler

Standardize on the Standard! Uniline* Flush Plates are the standard of design, quality and construction adopted by leading wiring device manufacturers.

The design and manufacture of every Uniline plate is uniform, with molding powders specified according to an established formula. The pleasing appearance and distinctive finish of these plates together with the complete range of types permits a uniform design throughout an installation.

Bryant Flush Plates are available in the Uniline design in 14 basic types, and in standardized ivory or brown colors.

*TRADE MARK COPYRIGHTED

STANDARDIZE ON THE STANDARD

Specify Bryant Devices from your Electrical Wholesaler

THE BRYANT ELECTRIC COMPANY

SUPERIOR WIRING DEVICES

BRIDGEPORT 2, CONNECTICUT

ARMY E NAVY

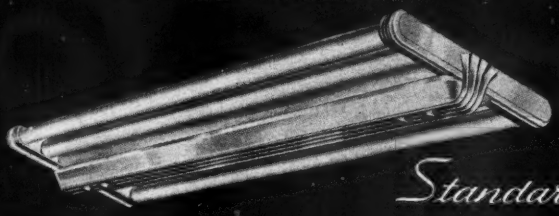
NEW YORK SAN FRANCISCO CHICAGO LOS ANGELES

A SUBSIDIARY OF WESTINGHOUSE ELECTRIC CORPORATION

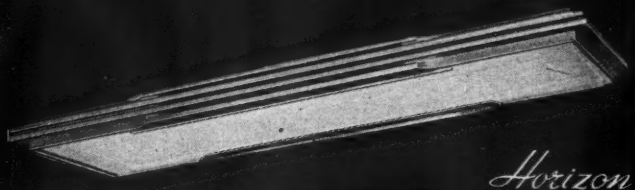
by Smithcraft

It has well been said that "for top craftsmanship in Lighting Fixtures, it's always SMITHCRAFT." And a glance at these fixtures will indicate that there's plenty of Style, too. When you recommend and sell SMITHCRAFT LIGHTING FIXTURES, we know that you will be conforming to the trend of the times in the illumination field.

TOMORROW'S LIGHTING FIXTURES AVAILABLE TODAY

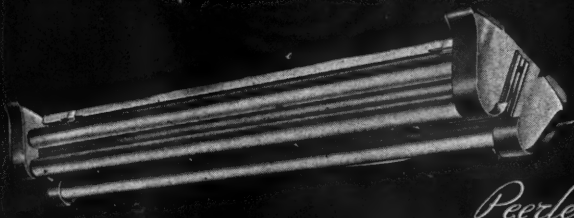


Standard

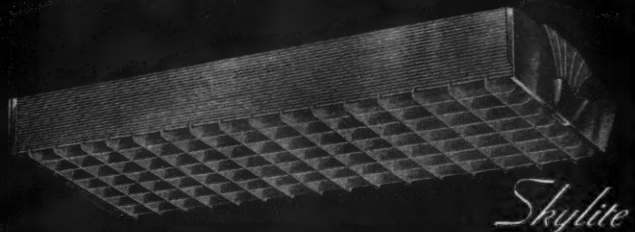


Horizon

OUTSTANDING FOR ORIGINALITY AND DISTINCTIVE DESIGN

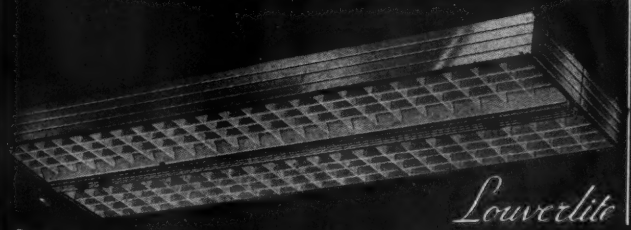


Peerless

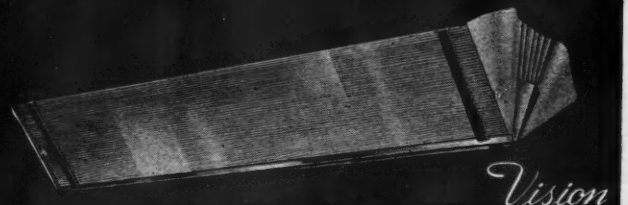


Skylite

SMARTLY STYLED AND CORRECTLY ENGINEERED IN EVERY WAY

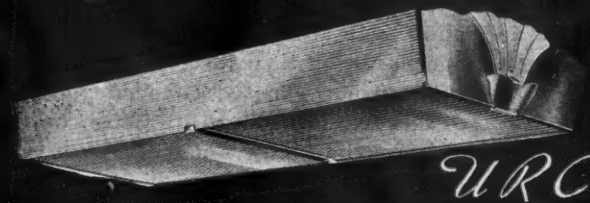


Louvrlite



Vision

DESIGNED FOR SIMPLIFIED INSTALLATION AND MAINTENANCE



URC



Dawn

WITH ALL THE CHARACTERISTICS OF A CUSTOM-MADE LINE



This Attractive
NEW CATALOG

will give you full details and illustrations of the SMITHCRAFT line. Let's get better acquainted — send for your copy. We want you to have one always at hand.

Smithcraft
LIGHTING DIVISION
Chelsea 50, Mass.

TW Wire Insulation made from GEON approved by Underwriters' Laboratories



WIRE insulation made from GEON has been approved by Underwriters' Laboratories for use in wet locations, eliminating the need for lead sheathing. Besides this advantage, GEON permits the use of thinner insulation and makes possible a smaller diameter wire—thus more conductors and more power per conduit. Other characteristics of GEON make possible an insulation which does not require a protective braid and which has superior all 'round long-time aging and electrical properties.

How's this for a test of an insulating material—*immersed in water for 106 days at 70 degrees C?* (This test conducted by Electrical Testing Laboratories, Inc.) Insulation made from GEON stood that test, and came out with its electrical properties practically unchanged!

TW insulation made from GEON is flame resistant, too—it extinguishes itself, an added important property in wet locations where exposed connections increase the danger of short circuit and fire. Corrosive conditions are common in wet locations. But they have no effect on insulation of GEON which resists the action of acids, alkalies, oil, greases, mildew, heat, cold and many other normally destructive factors.

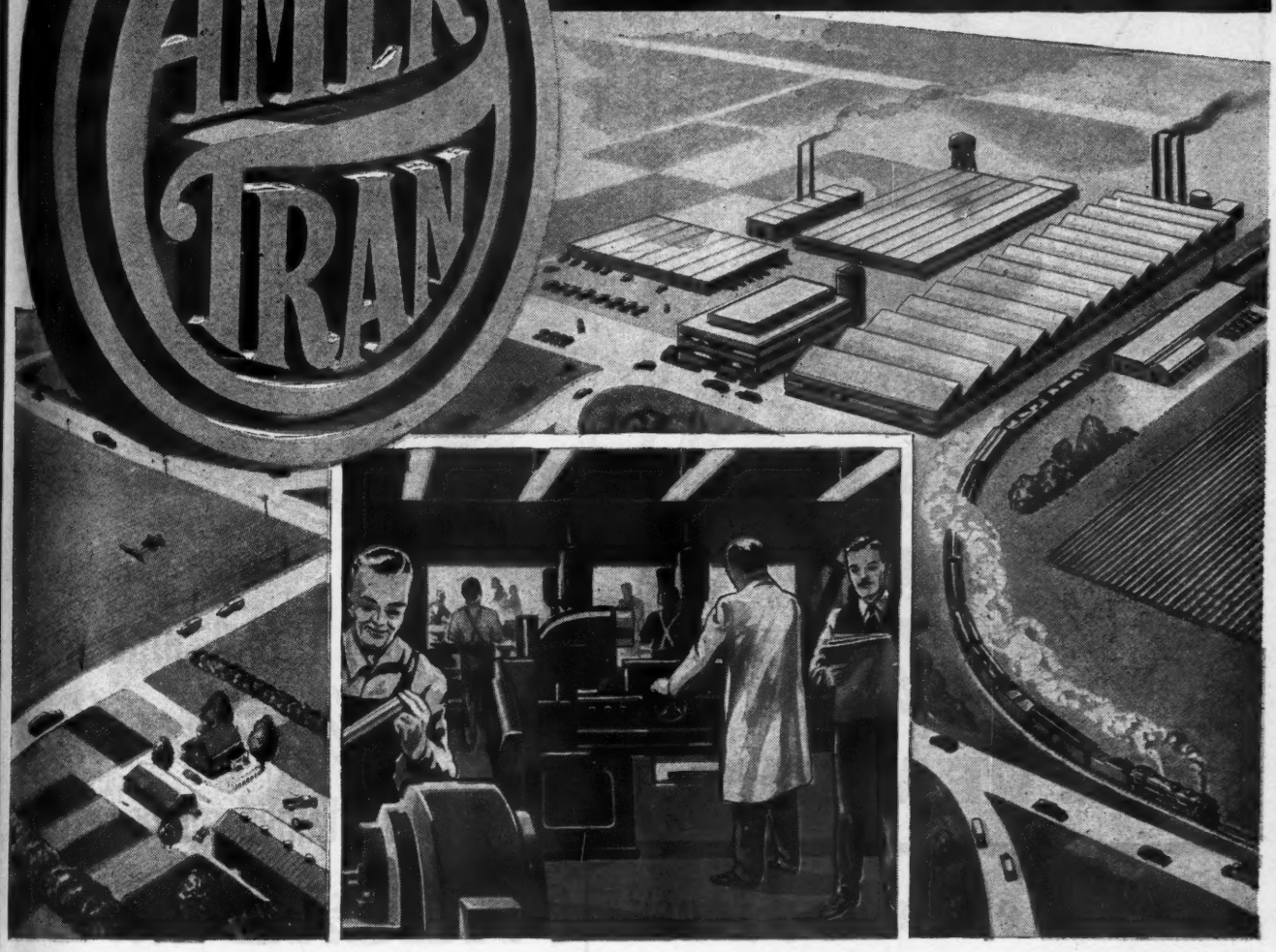
Our development staff and laboratory facilities are available to help you work out any special problems. For more complete information write Department YY-9, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Geon
Polyvinyl Materials

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

DISTRIBUTION TRANSFORMERS



FOR THE RURAL INDUSTRIAL PLANT...

Standby equipment and replacement inventories can be carried to an uneconomical point in rural plants. The remedy for this is more dependable equipment. Realization of this fact has caused plant management to prefer the trouble-free durability of AmerTran Distribution Transformers.

Ruggedness has been increased and greater protection has been added to the new AmerTran Distribution Transformers. As a result of their overall economy, the advantages of load center power distribution will cost still less.

AMERICAN TRANSFORMER COMPANY, 178 Emmet St., Newark 5, N. J.

LOOK FOR THESE ADVANTAGES IN THE COMING AMERTRAN DISTRIBUTION TRANSFORMERS

Lower Exciting Current
Smaller Size . . . Lighter Weight
Increased Overload Capacity
Improved Tank Construction
Coordinated Insulation
Improved Regulation
New Terminal Facilities

AMERTRAN

MANUFACTURING SINCE 1901 AT NEWARK, N. J.

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

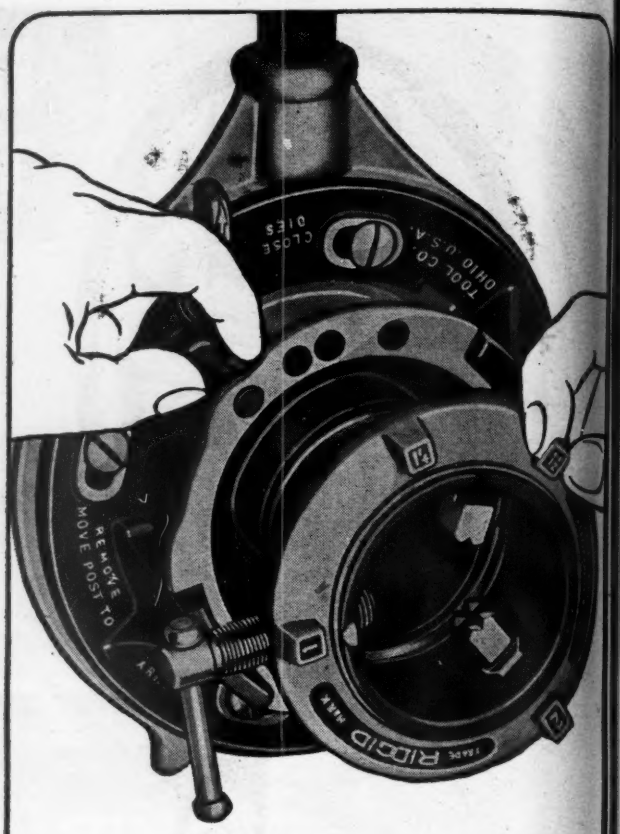


FAST EASY *Safe* PIPE REAMING

with this extra-long-taper RIDGID



● You whisk the burr—and only the burr—from any pipe with easy feather-light ratcheted strokes when you use RIDGID Reamer. No thinning of pipe or conduit wall, no splitting or flaring—because of the extra long taper of this remarkable tool. You save pipe—as well as work and time. Buy it complete with ratchet handle—or if you own a RIDGID 00R threader, it fits the handle; buy the reamer unit only. Ask your Supply House.



Thread your 1" to 2" pipe with *less effort, less time* with self-contained, quick-setting RIDGID No. 65R

● It cuts smooth perfect threads—its 1 set of high-speed steel chasers that stay in it (instead of 4 sets to fool around with) adjust to thread 1", 1¼", 1½" or 2" pipe in a mere 10 seconds—its nearly automatic workholder sets to pipe size instantly: there you have the reasons why this rugged steel-and-malleable No. 65R is so widely popular with men who know pipe threaders. For the easiest most efficient threading you've ever enjoyed buy this RIDGID—at your Supply House. We're doing our best to keep supply up to demand, so keep asking.



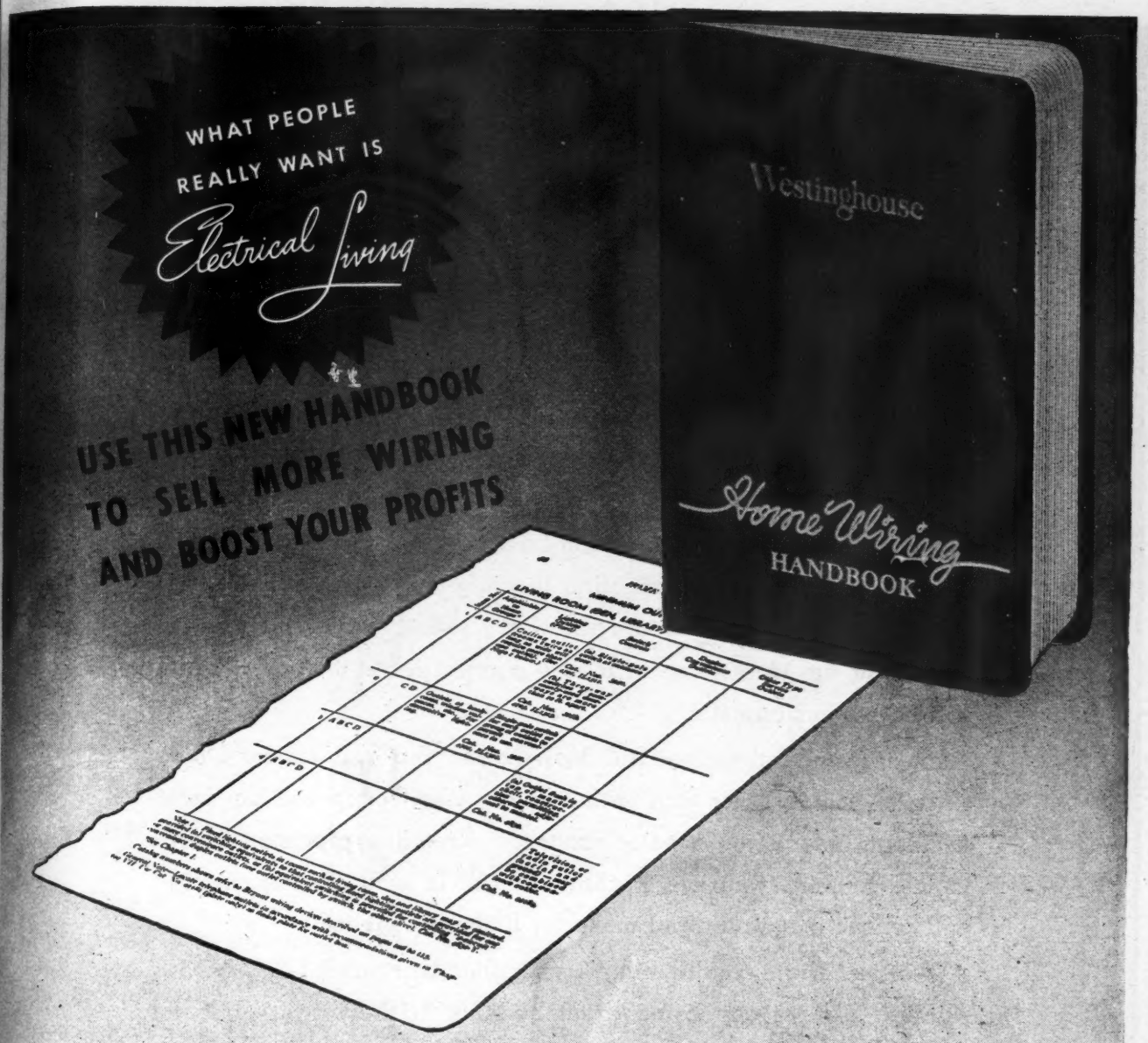
No. 65R stands up handily on the floor.

Millions of RIDGID Tools in use

RIDGID

WORK-SAVER PIPE TOOLS

The Ridge Tool Company
Elyria, Ohio, U. S. A.



Westinghouse advertising in America's favorite magazines is making people want an electrical system that will give them the full benefits of Electrical Living.

Advertising to architects, builders, financial institutions and real estate developers about the importance of proper wiring has opened the door for you to sell complete electrical systems . . . not just another wiring job.

That means more circuits. More outlets. Wire of ample size. Modern circuit protection. And quality wiring devices and workmanship.

With this new handbook you can show architects and builders the wiring they should specify and install in homes to meet public demand. Every electrical detail is explained. Control centers, feeders, circuits, circuit protection, signal systems, telephone and radio facilities. And many others.

It will pay you to be familiar with these important details, and to see that all who influence new home construction are fully informed. This Home Wiring Handbook will help. Get your copy today. Cost, one dollar.

J-91529-A

Westinghouse

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as a part of its consulting service to the home building profession, offers the following FREE BOOKS: Electrical Living in 194X (Professional Edition); Manual of Better Home Wiring.

ORDER YOUR COPY NOW

Westinghouse Electric Corporation
Industrial Relations Department
306 Fourth Avenue, Pittsburgh 30, Pa.

Gentlemen:

I enclose $1.00 for a copy of your "Home Wiring Handbook".

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Street.....

City..... State.....

How Bright Do You Want Your Bright New World?

Bright as the sun? Science could easily manage it.

But real "light conditioning" means much more than just measuring lumens and foot candles.

Light conditioning is an exacting science. Not only "how much" light, but "how good" are the questions with which Frink engineers concern themselves.

Frink L-I-N-O-L-I-T-E fluorescent lighting fixtures will provide the scientifically diffused illumination that will be demanded after the war. Each room will be evenly aglow at just the level of illumination proper for the work done in it. Eye comfort never before attained will be a commonplace.

In stores merchandise will look better and sell faster. Office workers will do their jobs with greater ease. There will be fewer accidents in factories, greater accuracy in reading precision instruments. In fact, wherever artificial light is used, "better seeing" will relieve eye strain and make for lifelong benefits.

Yes, real "light conditioning" as supplied by Frink L-I-N-O-L-I-T-E lighting fixtures can bring great benefits in the bright—but not glaring—new era that final peace will usher in.

FRINK

LIGHTING SINCE 1857

L-I-N-O-L-I-T-E

Reg. U. S. Pat. Off.

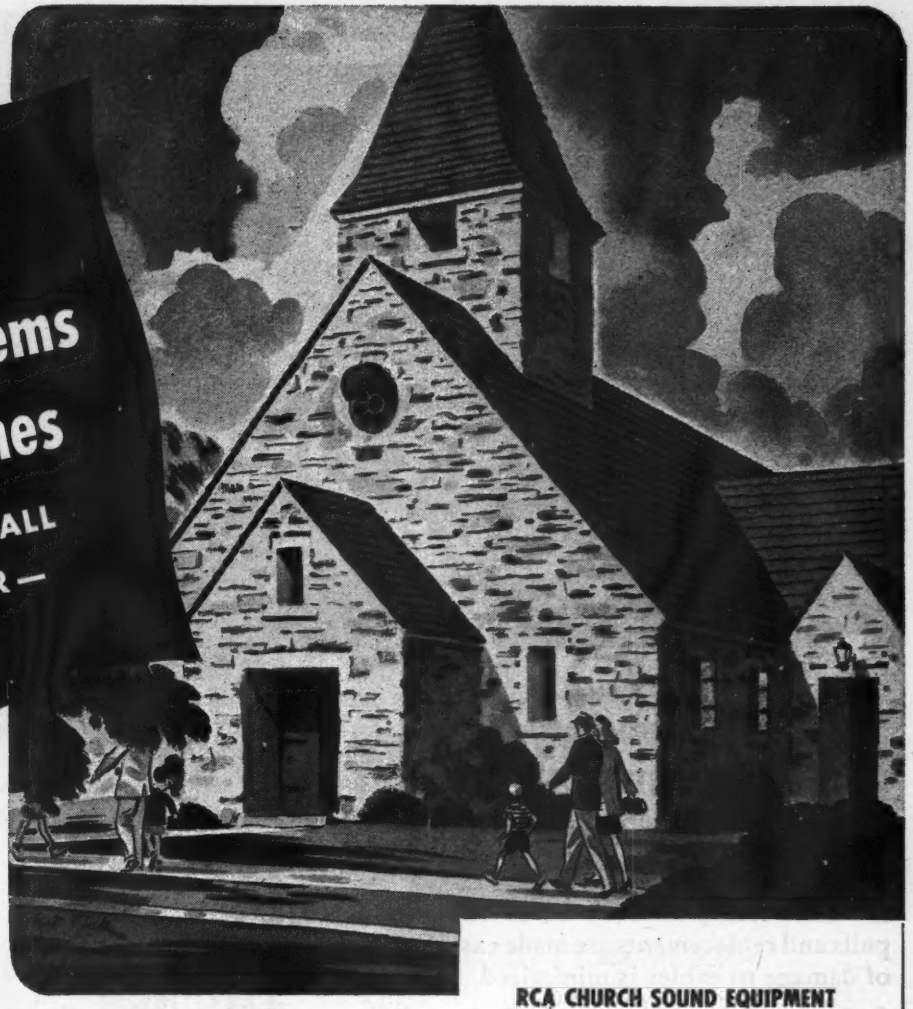
THE ULTIMATE IN FLUORESCENT LIGHTING

THE FRINK CORPORATION, Bridge Plaza North, Long Island City 1, New York

SUBSIDIARIES: Sterling Bronze Company, Inc. • Barkon-Frink Tube Lighting Corporation

RCA Sound Systems for Churches

—SO THAT ALL MAY HEAR—



SERVICES—
MUSIC—
SERMONS—

RCA Sound Systems make it possible for every member of the congregation to hear services, sermons, special announcements, choir and music... *RCA Hearing Aids* may be installed in certain sections of the church for the convenience of the hard of hearing... *RCA Electronic Bells* of beautiful tone and extended frequency range bring the impressiveness of great cathedral chimes to any-size church... *Intercommunication Facilities* link the administration office, vestry, parish house, school, social hall, and all other rooms of the church building or buildings.

RCA manufactures Sound Equipment for churches, schools, other institutions, and all types of public buildings. Design Sound into new or remodeled structures. If you need assistance with your project, an RCA Sound Specialist is at your service. Write Department 70-140-B, Sound Equipment Section, Radio Corporation of America, Camden, N. J.

RCA SOUND SYSTEMS

RCA CHURCH SOUND EQUIPMENT



Speakers—wall-cabinet and flush-mounted types for inside use: horn-baffle type for outdoor use.

Microphones—dynamic and velocity types in either table or floor-stand mounting.





Electronic Bells of remarkable tone quality—need no structural reinforcement, require little space.

Intercom units—for communication between rooms or buildings.





16mm Sound Projector—for showing religious, educational or entertainment films.

BUY MORE WAR BONDS

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION · CAMDEN, N. J.
LEADS THE WAY . . In Radio . . Television . . Tubes . . Phonographs . . Records . . Electronics

70-6336-140

UPKEEP GOES DOWN

with these UNDERGROUND CABLEWAYS



These 5 advantages of TRANSITE DUCTS assure low maintenance

1. *Permanently smooth bore*... long cable pulls and replacements are made easy. Danger of damage to cables is minimized.

2. *Easily and quickly installed*... long, lightweight lengths and simple assembly method assure rapid, economical installation.

3. *Inorganic*... made of asbestos and cement compressed under great pressure. This provides permanence and strength...makes these ducts immune to rust and rot.

4. *Immune to electrolysis*... being entirely inorganic and non-metallic, Johns-Manville Transite Ducts are not affected by electrolysis or galvanic action.

5. *Incombustible*... won't contribute to the formation of dangerous smoke, gases, or fumes. If burnouts do occur, these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

For complete details on J-M Transite Ducts, write for Data Book DS-410, Johns-Manville, 22 East 40th Street, New York, N. Y.

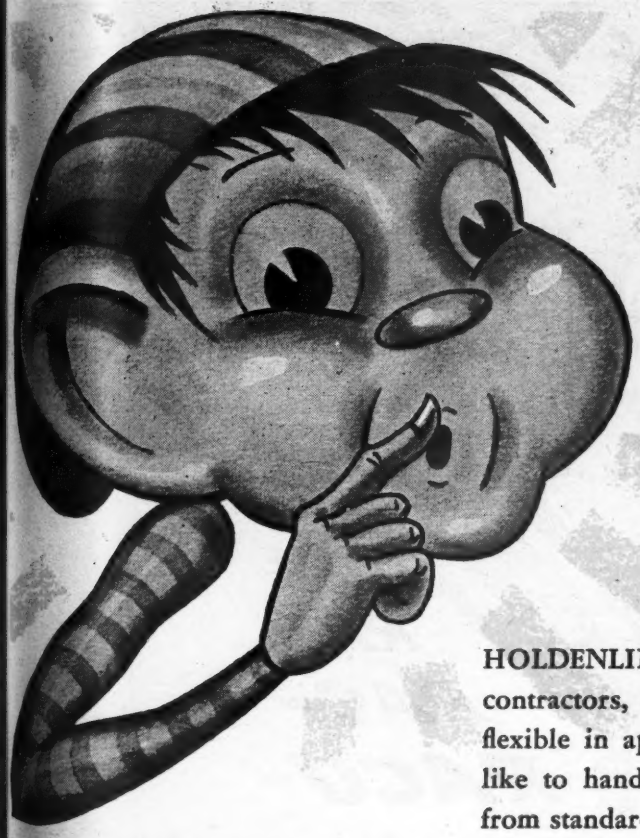
TRANSITE KORDUCT *above*—for installation in concrete. Thinner-walled but otherwise identical with Conduit.

TRANSITE CONDUIT—for exposed work and for use underground without a concrete encasement.

Johns-Manville

TRANSITE DUCTS

JM



It's No Secret that

HOLDENLINE CHAN'L-RUN

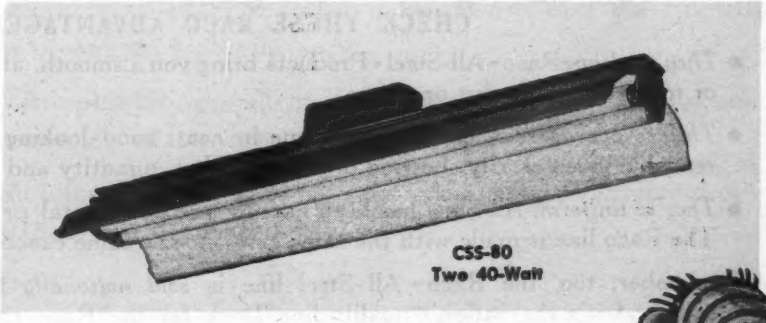
is a Friendly Line for Contractors

HOLDENLINE CHAN'L-RUN is a friendly line for contractors, easy to sell and service, quick to install, flexible in application, the kind of a line contractors like to handle because all applications can be made from standard individual units.

HOLDENLINE CHAN'L-RUN is a friendly line for the contractor's *customers,* economical to buy, efficient in service, easy to maintain.

And, equally important to contractor and customer . . . HOLDENLINE CHAN'L-RUN fixtures deliver plenty of soft fluorescent light right where it helps most to increase production, reduce errors and waste, cut production costs.

Contractors Who Keep Customers Friendly Know These Advantages



CSS-80
Two 40-Watt



1. No dark areas between lamps on CSS-80 shown.
2. Ample wire freeway for easy conversion to continuous.
3. No lamp or socket breakage because butt-on sockets mounted on heavy welded steel plate prevent it.
4. High lighting efficiency, photometrically designed reflectors. None better.

Ask for latest catalog. We're glad to send it.

SOLD THRU WHOLESALERS ONLY

HOLDENLINE COMPANY

Pioneers in Fluorescent

1963 EAST 57TH STREET • CLEVELAND 3, OHIO

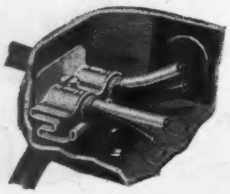


Put away Webster, Professor, you won't find "Raco" listed there. But electrical contractors, architects and builders the country over will tell you RACO is the trademark for the All-Steel-Equip line of switch boxes, outlet boxes and fittings.

CHECK THESE RACO ADVANTAGES

- *They're clean.* Raco • All-Steel • Products bring you a smooth, attractive finish. No jagged or rough edges, no dirt or grease.
- *They're packaged.* Raco products come in neat, good-looking cartons. Cartons have a readable index clearly showing product number, quantity and finish.
- *They're uniform.* All-Steel has been making precision metal products for over 32 years. The Raco line is made with the same care—to the same exacting standards!

Remember, too, the Raco • All-Steel line is *sold nationally* through *wholesalers only.* You'll find it's the nation's quality line. Look for the Raco trademark—a sure sign of dependable products.



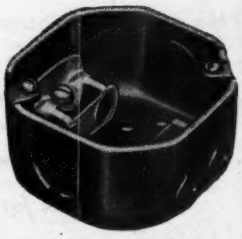
DO-21-N-3 3½" dia.
DO-16-N-3 4" dia.

Use Raco clamp type boxes to solve many of your connector worries.

DO-21-N-3, 3½" dia. is widely used with non-metallic cable.

DO-30-N, 3½" dia. is the perfect box for use with "BX."

ALL-STEEL-EQUIP COMPANY, INC.
600 Kensington Avenue, Aurora, Illinois



DO-30-N 3½" dia.
DO-31-N 4" dia.

RACO • ALL-STEEL • PRODUCTS
SWITCH BOXES • OUTLET BOXES

5 Features that CLINCH SALES



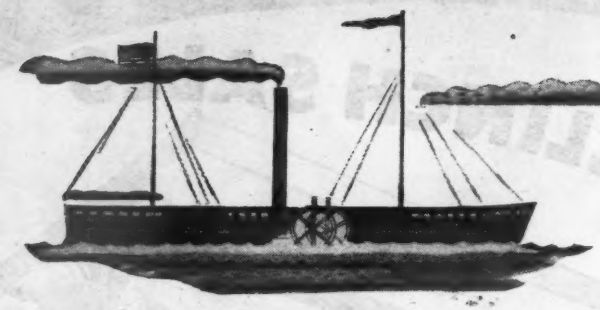
The Curtis SKYLUX

- ★ **Simple Beauty** in functional design makes the SkyLux one of the most attractive units on the market.
- ★ **Shielded Lamps** achieve a careful compromise in concealing the lamp from the eye at normal viewing angles without sacrifice of light delivery.
- ★ **High Utilization:** 90% of light output is downward and the Fluracite finish assures prolonged high efficiency.
- ★ **Installation Adaptability** permits pendant or ceiling, individual or continuous-line mounting at low installation cost.
- ★ **Minimum Maintenance** of reflecting surfaces because horizontal dust collecting surfaces are eliminated in design.

Your selling story will be appreciably strengthened by all the technical details and sales facts we have available on SkyLux. Write today for our four-page bulletin.

CURTIS Lighting, INC.

6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

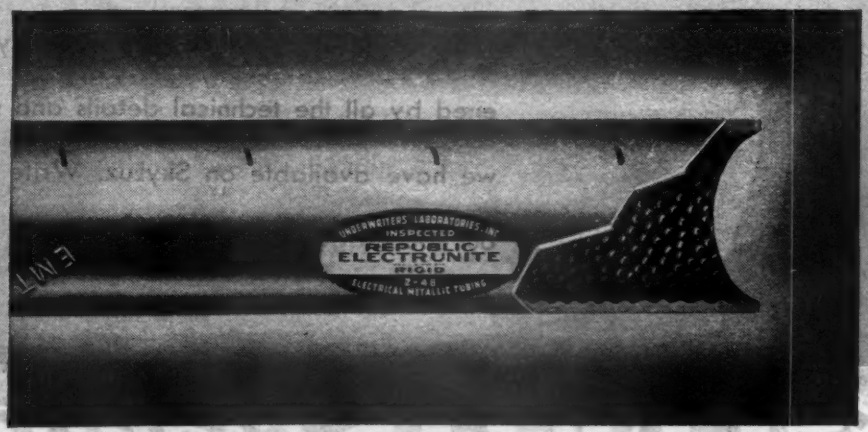


LIKE THE STEAMSHIP

Electrical Raceways

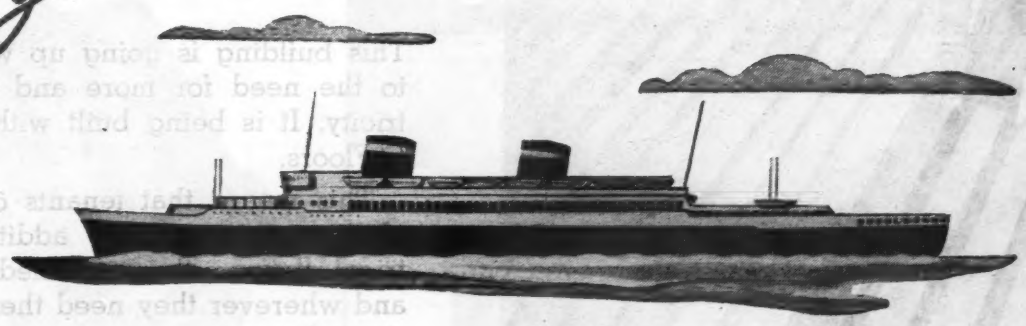


Millions of feet of ELECTRUNITE E.M.T. have been installed in concrete. It resists structural abuse. Joints are watertight. There are no exposed threads to rust. It is easy to install in narrow spaces, between pans—and it takes up less space than threaded conduit in shallow slabs.



Every length of ELECTRUNITE E.M.T. is plainly and accurately marked from end to end in feet and inches. And its knurled inside finish, shown in the cutaway section above, further aids installation by making wire pulling as much as 30% easier.

have gone modern, too!



For Ease of Installation, Safety and Dependability It Pays to Use *MODERN* REPUBLIC ELECTRUNITE E.M.T.

For every type of wiring, Republic ELECTRUNITE E.M.T.—the streamlined electrical raceway—offers a combination of advantages which cannot be duplicated by any other type of conduit.

Because this *modern* steel conduit is threadless, light in weight, uniformly ductile and inch-marked, it goes in *faster* and *easier* than old-fashioned types of conduit.

Dirty, tedious thread cutting is eliminated. Two simple compression-type fittings—one for coupling lengths of E.M.T. and the other for joining to outlet boxes or for adapting E.M.T. to standard threaded fittings—make strong, watertight joints in a hurry.

Inch-Marking — an exclusive ELECTRUNITE feature, illustrated at left—makes it easy to form bends of predetermined accuracy, either in the shop or on the job.

ELECTRUNITE E.M.T. meets building safety requirements, too. Its inspection by Underwriters Laboratories and approval by The National Electrical Code constitutes positive assurance that it provides adequate electrical and mechanical protection throughout the installation. Moreover, its tightly adherent zinc coating—unbroken by threads and unmarred by pipe wrench teeth—offers continuous and lasting protection against rust and corrosion.

For further information about Republic ELECTRUNITE E.M.T., including its low cost, see your nearest ELECTRUNITE Distributor.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 3, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic
ELECTRUNITE E.M.T.
REG. U. S. PAT. OFF.

LIGHT WEIGHT SEAMLESS ROLLED STEEL CONDUIT



With an eye to

continuous electrical change

This building is going up with an eye to the need for more and more electricity. It is being built with Robertson Q-Floors.

This means that tenants can call an electrician and have additional electrical floor outlets installed whenever and wherever they need them—on any six-inch area.

Q-Floors encourage tenants to use more electrical equipment. They also encourage tenants to change their floor plans frequently to cope with changing conditions. This creates steady demand for electrical work.

Q-Floors promote *continuous electrical change.*

H. H. ROBERTSON COMPANY

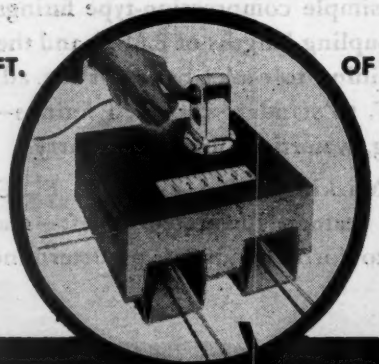
2400 Farmers Bank Building, Pittsburgh, Pennsylvania

Offices in 50 Principal Cities World-Wide Building Service

★ ★ ★

Electrical Fittings for use with Robertson Q-Floors can be obtained from General Electric Construction Materials distributors. See the nearest G.E. merchandise distributor for information on how Q-Floor fittings can be used to attain up-to-the-minute electrical wiring.

THIS IS 1 SQ. FT. OF Q-FLOOR



Q-FLOORS

Available through your "3C" Distributor

"3C" FOOT OPERATED MASTER SWITCHES

(BULLETIN 101-FS)



Open View—Type FSA-22, 2 Pole, Horizontal Mounting—Left Hand operation.

A wide range of operations is covered with the many types of "3C" Foot Switches. Write for fully descriptive "3C" Bulletin 101 F-S.



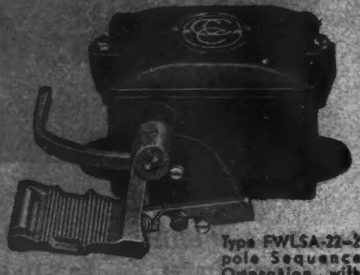
Type FSVA-11, 22 or 33–1 or 2 pole, with Latch. Vertical Mounting.



Type FSLA-11, 22 or 33–1 or 2 pole, with Latch. Horizontal Mounting.



Type FWSA-22–2 pole Sequence operation.



Type FRSA-22–2 pole, 3 position.



Type FWLSA-22–2 pole Sequence Operation, with Latch.



Type FSA-44–4 pole Horizontal or Vertical Mounting. Watertight.



Type FRSA-44–4 pole, 3 position—Horizontal Mounting. Watertight.

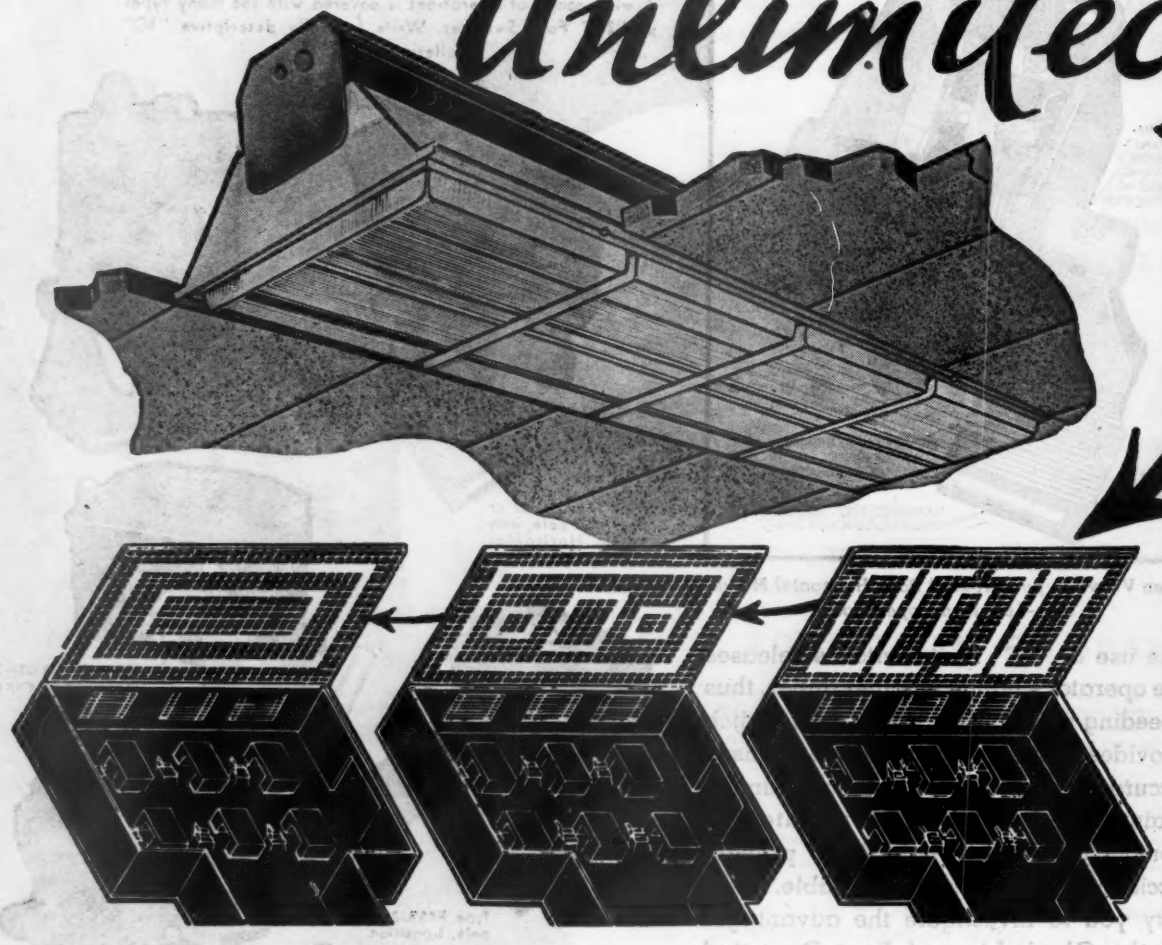
Safety shield and floor plate optional on any 1 or 2 pole "3C" foot switches.

The use of "3C" Foot Switches releases the operator's hands for other duties, thus speeding production. A "3C" Foot Switch provides a sturdy, long life mechanism, accurate and dependable, with minimum maintenance. Latches for maintained contact and safety shields to prevent accidental operation are available. It will pay you to investigate the advantages of the Clark Line of Foot Operated Master Switches as described in "3C" Bulletin 101 F-S.

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • EVERYTHING UNDER CONTROL

The Miller Fluorescent Troffer Lighting System gives you *Ceilings Unlimited*



Other Pluses of MILLER Fluorescent Troffer Lighting Systems:

Supports from structural ceiling reduced 50 to 75%.

Conduit and conduit fitting costs reduced up to 80%.

Wiring costs reduced up to 50%.

Permanent operation and maintenance economies.

This lighting system is truly versatile. In fact, its practicable applications are almost unlimited. Note today's trend towards planning the *building* around the *lighting!*

In geometric patterns and lightstrips "by the mile," Miller Fluorescent Troffer Lighting Systems suggest new architectural themes. So do their glass and plastic lenses, plates, and metal or plastic grilles . . . all designed to meet specific architectural and lighting requirements.

And they're engineered to lick *structural* problems, too. One example of this is the patented Miller Bracket:

It does away with laborious fitting of recessed lighting systems in hung ceilings. One simply hangs the bracket from the *structural* ceiling—and both furred ceiling and Troffer Lighting System are hung *from the bracket!*

Miller field engineers are conveniently located. They will be glad to explain this and other Miller advantages—clearly and briefly.

THE MILLER COMPANY • MERIDEN, CONNECTICUT

LLUMINATING DIVISION
Fluorescent, Incandescent Mercury Lighting Equipment

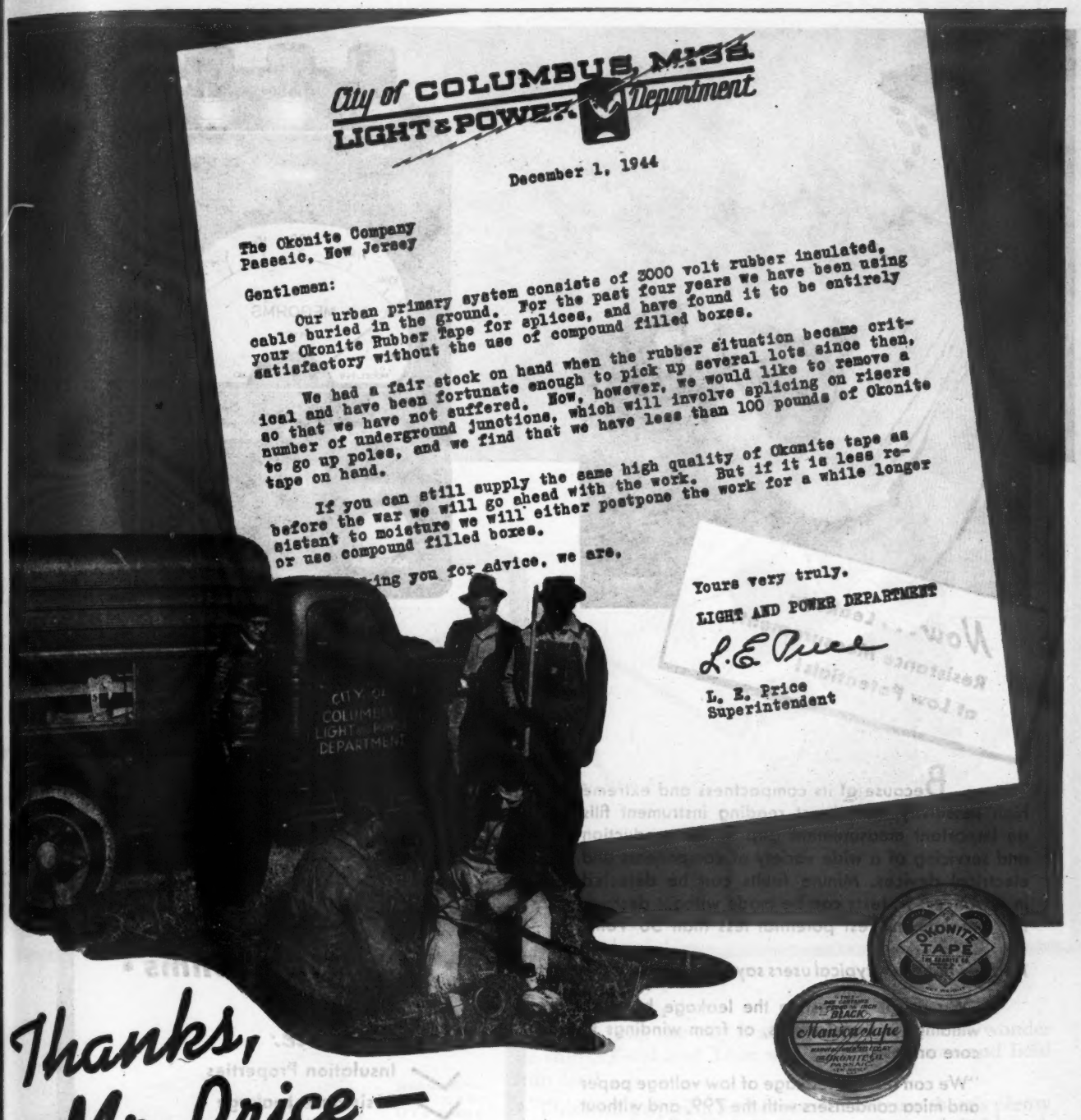
OIL GOODS DIVISION
Domestic Oil Burners and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

FOUNDRY DIVISION
Non-Ferrous Metal Castings

MILLER
SINCE 1844



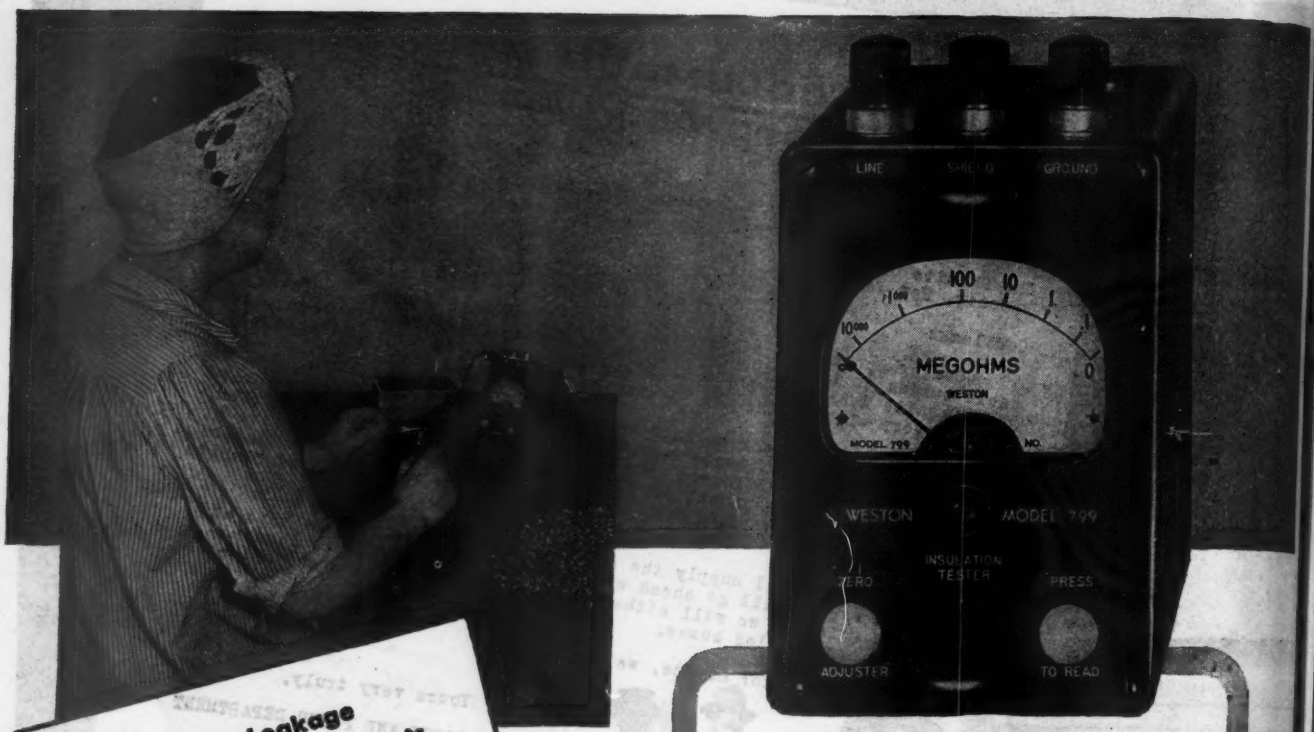
Thanks, Mr. Price—

We at Okonite like to get letters that tell us about good jobs done by our products. Naturally that goes for tapes as well as cables. And—also naturally—we like to get orders. Remain assured that in Okonite and Manson tapes we have consistently refused to use substitutes, and any such tapes you obtain are "the same high quality . . . as before the war."

But we haven't been able to fill all our orders for Okonite and Manson tape because of government restrictions on critical rubber. When Okonite and Manson tapes are again available to all, there will have been no let-down in what they have always offered utilities, railroads, and other industry. Long service life, for example, moisture resistance . . . better splicing . . . toughness and weathering qualities . . . in short, what it takes to give a joint the best insulation and mechanical protection that money can buy.

• When unable to obtain Okonite and Manson tapes, many of our customers are obtaining satisfactory results from our Dundee tapes or our Hazard Division's Panther and Dragon Tapes. The Okonite Company, Passaic, New Jersey.

OKONITE and MANSON TAPES
wherever electrical splices are needed



Now . . . **Leakage Resistance Measurements at Low Potentials!**

Weston

MODEL 799

INSULATION TESTER

• 10 BILLION Ohms •

will measure:

- ✓ **Insulation Properties**
- ✓ **Resistance Leakage**
- ✓ **Conductivity of Insulating Materials**
- ✓ **Leakage due to Moisture Absorption**
- ✓ **Readings — .1 to 10,000 megohms**

Because of its compactness and extreme high sensitivity, this direct reading instrument fills an important measurement gap in the production and servicing of a wide variety of components and electrical devices. Minute faults can be detected *in advance* . . . tests can be made without destructive breakdown. Test potential less than 50 Volts.

Here's what a few typical users say about Model 799:

"We use it for testing the leakage between windings in transformers, or from windings to core or case."

"We can test the leakage of low voltage paper and mica condensers with the 799, and without danger of damaging the dielectric."

"We test leakage resistance between individual wires in cable harnesses."

"Model 799 is also ideal for checking leakage due to moisture in fiber terminal strip."

For complete data on Model 799 Insulation Tester, communicate with the WESTON representative in your locality, or write...Weston Electrical Instrument Corporation, 672 Frelinghuysen Ave., Newark 5, N.J.

Weston *Instruments*

ALBANY • ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • JACKSONVILLE • KNOXVILLE • LOS ANGELES • MERIDEN
MINNEAPOLIS • NEWARK • NEW ORLEANS • NEW YORK • PHILADELPHIA • PHOENIX • PITTSBURGH • ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS • SYRACUSE
In Canada, Northern Electric Co., Ltd., Powerlite Devices, Ltd.





Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications

Judging from the way it sticks to the job, it's no wonder he thinks Gold Seal Tape will snare the mouse and hold him fast!

This firm-gripping tack is assured because there's plenty of high adhesion compound in every inch of Gold Seal. It won't smear your hands, though, in any weather . . . won't ravel or peel, either, because Jenkins scientifically checks every batch of friction compound, every bolt of base cloth.

You're sure of this uniform high quality in the Gold Seal Tape you buy, because every roll is snugly wrapped in cellophane, sealed, and sturdily boxed to reach you factory-fresh. For trouble-free tape, always ask for Gold Seal by name. Jenkins Bros., Rubber Div., 80 White St., New York 13, N. Y.

JENKINS

Gold Seal Tapes

FRICTION and RUBBER TAPES

A Tribute

to all those who helped in the greatest scientific achievement of all time... the

ATOMIC BOMB

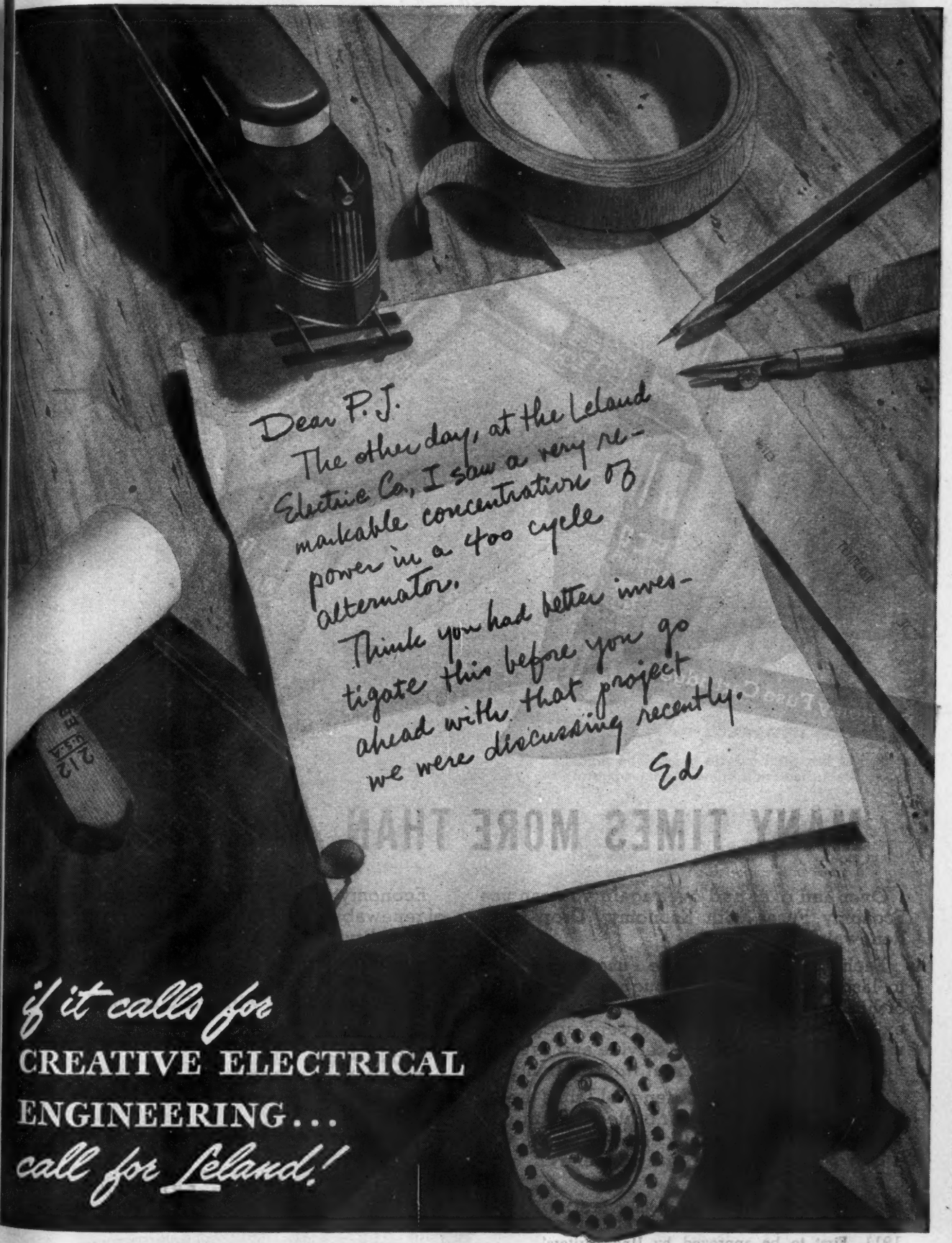
"TO KEEP THE PEACE"

For the inspiration and leadership displayed by the Executive, Military, and Naval authorities... to the Scientists... Engineers... to Labor, and to those Companies that played a part in this unprecedented achievement, General Cable voices the sentiment of America in extending highest praise and heart-felt appreciation. Because of their scientific genius, their untiring effort and their complete devotion to this gigantic task, Victory comes sooner and all mankind benefits.

General Cable Corporation is also justly proud of the contribution made by its own staff in the engineering development and manufacture of still secret and exceedingly special materials essential in the production of this device of war... and of Peace.

GENERAL CABLE CORPORATION

MANUFACTURERS OF BARE AND INSULATED WIRES AND CABLES FOR EVERY ELECTRICAL PURPOSE



if it calls for
CREATIVE ELECTRICAL ENGINEERING...
call for Leland!

Motors, Generators, Motor Generators and Voltage Regulators

THE Leland *ELECTRIC COMPANY*

DAYTON, OHIO • IN CANADA, LELAND ELECTRIC CANADA, LTD.... GUELPH, ONTARIO



Economy Fuse Cartridges

MANY TIMES MORE THAN *Nine Lives!*

Over and *over* and *over* again you can use Economy Fuses with Economy "Drop Out" Renewal Links.

Each Economy Cartridge Fuse is designed to last indefinitely... a tough molded body of high grade vulcanized fibre tubing, with extra heavy brass inserts and caps, accurately machined...built to give service and prevent needless and costly current interruptions.

Economy "Drop Out" Renewal Links are inexpensive...give *full limit* protection...are easily and quickly replaced to restore a blown fuse to its original efficiency.

Economy pioneered and developed the use of renewable fuses. It has constantly improved the quality, performance and dependability of Economy Fuses and "Drop Out" Renewal Links.

Protection with ECONOMY

Cartridge Type		
0-600 Amps	250 Volts
0-600 Amps	600 Volts
Plug Type	
3-30 Amps	125 Volts

Protection WITH ECONOMY

TIME-TESTED • RELIABLE • SAFE

Representatives in all principal cities... SOLD THROUGH JOBBERS EXCLUSIVELY SINCE 1911. First to be approved by Underwriters' Laboratories.

ECONOMY Fuse and Mfg Co.

2717 Greenview Ave., Chicago 14, Illinois

When Designing or Modernizing Interiors and Display Windows

Pittsburgh Permaflector





PITTSBURGH PERMAFLECTORS ARE:

"TOPS" *in appearance*

Whether you require fluorescent or incandescent lighting equipment for interiors and windows, you can be certain *Pittsburgh Permaflectors* are distinctively styled and in good taste.

"EASY" *to install and maintain*

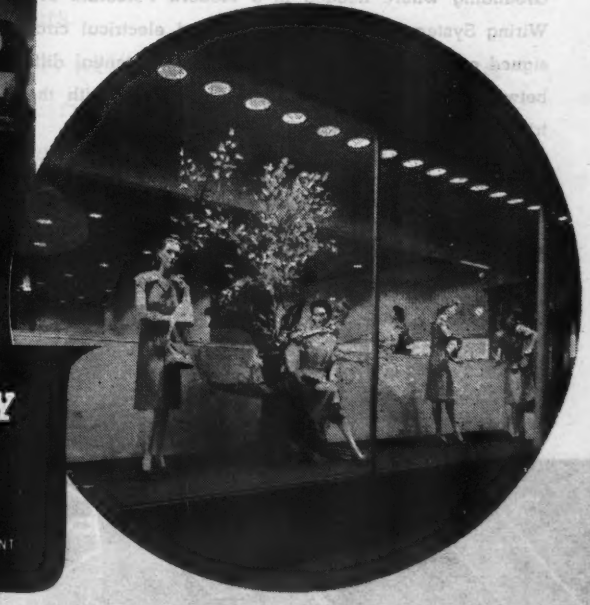
Easily mounted . . . easily maintained . . . practically designed for low cost installation and servicing.

"PEAKS" *for performance*

Light engineered to give long and lasting performance at maximum illuminating efficiency.

"PRICED" *right*

Low initial unit cost coupled with less installation and maintenance costs plus long life make *Pittsburgh Permaflector* Lighting Equipment a "must" for modern lighting.



"Pittsburgh" Permaflector

Pittsburgh Reflector Company

OLIVER BUILDING · PITTSBURGH 22, PA.

MANUFACTURERS OF PERMAFLECTOR LIGHTING EQUIPMENT
DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

Permaflector Sales Engineers in All Principal Cities

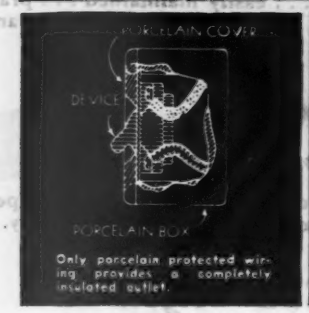
PERMAFLECTORS · SPOTLIGHTS · FLOODLIGHTS · WIRING DEVICES · FLUORESCENT EQUIPMENT

Ageless

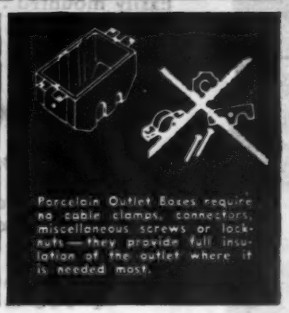
ELECTRICAL PORCELAIN

Stands up under the worst conditions encountered in wiring installations . .





Only porcelain protected wiring provides a completely insulated outlet.



Porcelain Outlet Boxes require no cable clamps, connectors, miscellaneous screws or locknuts—they provide full insulation of the outlet where it is needed most.

THE GROWTH of the electrical porcelain industry and the present-day dependence placed upon this material in modern distribution of electrical energy speaks volumes for the all-around insulating characteristics of porcelain.

There are millions of homes in America wired with Porcelain, some dating back as far as 1890. The principle of wire spacing as is followed in Modern Porcelain Protected Wiring is evident in what is claimed to be the first residence in the United States to be wired for electricity in Green Bay, Wisconsin.

Modern plumbing conveniences, with its varied applications requiring that water be supplied to almost every part of the home—bathrooms, kitchens, laundries, furnaces, etc., have created additional considerations from the architect who must lay out the wiring plans in accordance with these new demands. Condensation producing moisture and dampness provide many leakage paths for electrical currents. These are dangerous to life. By using Modern Porcelain Protected Wiring this hazard is reduced to a minimum, for Porcelain Outlet Boxes and wiring in open air keep electrical energy in the path where it belongs. Porcelain is non-corrosive and spaced conductors do not lie in wet containers to rot away the insulation.

Porcelain Protected Wiring is especially recommended for corrosive atmosphere. Present-day manufacturing includes chemical processes which will destroy ferrous or non-ferrous materials. Porcelain is not destroyed by chemical action, hence, with the newer wire insulations it is the true and logical barrier to destructive corrosion.

Hundreds of thousands of porcelain boxes have been installed in farm buildings where moisture and corrosive ammonium vapors exist and have demonstrated their values of durability and safety. Modern Porcelain Protected Wiring Systems have solved the troublesome condition of corrosion, smoke, and moisture in railway yards and terminals.

Electrical energy distribution suffers continual replacements from salt air atmosphere in coastal cities. Many localities have corrected this by using Modern Porcelain Protected Wiring Systems. Many industries and real estate owners in other sections recognize the permanent value of Porcelain Insulation.

Modern Porcelain Protected Wiring Systems offer the safest inherent shock hazard protection. In bathrooms, kitchens, and basements use porcelain protected fixtures and devices. Grounding where needed in a Modern Porcelain Protected Wiring System is a carefully installed electrical circuit designed and used only to provide a zero potential difference between exposed metal surfaces associated with the electrical systems and adjoining grounded equipment.

★ **ILLINOIS ELECTRIC PORCELAIN CO.**
Macomb, Ill.

★ **PORCELAIN PRODUCTS, INCORPORATED**
Findlay, Ohio

★ **SPECIALTY PORCELAIN WORKS**
East Liverpool, Ohio

★ **SUPERIOR PORCELAIN COMPANY**
Portersburg, W. Va.

★ **UNIVERSAL CLAY PRODUCTS COMPANY**
Sandusky, Ohio



MODERN PORCELAIN PROTECTED WIRING SYSTEMS



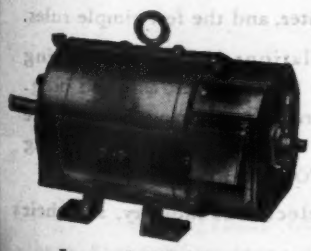
To Men Who Know Motors

. . . we could end our message here!

To men who know motors, a picture like this is worth the proverbial ten thousand words. It speaks with convincing eloquence of craftsmanship to which any motor builder could point with pride.

If you visit Star's modern plant, you'll see scores of examples of the same painstaking craftsmanship that pays off in outstanding performance for Star customers.

Star not only builds motors well, but also takes leadership in design. Star pioneered ball bearing motors . . . led in welded steel construction . . . developed the famed Star Built-in Magnetic Disc Brake for motors . . . pioneered in the field of gear-motors.



Integral HP Motor for Direct Current

Whether you need special or standard motors, ⅛ to 200 H.P., it will pay to learn why so many critical buyers specify "Star". Some standard motors are ready for early delivery. Star Electric Motors Co., 200 Bloomfield Avenue, Bloomfield, N. J.

STAR MOTORS

POWER PACKAGED AS YOU NEED IT

ANNOUNCING

WIREMOLD BUSINESS-BUILDERS

"HOW TO USE IT" Competition

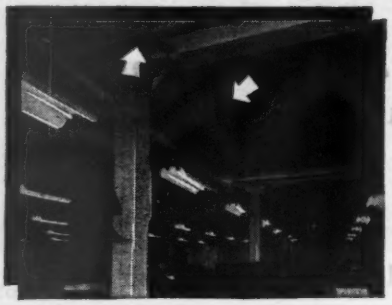
• REALLY WORTHWHILE PRIZES •

• 1ST. PRIZE . . . $500.00
• 2ND. PRIZE . . . $250.00
• 3RD. PRIZE . . . $100.00

$25 PAID FOR ALL ENTRIES USED IN WIREMOLD PROMOTION

OPEN TO ALL
CONTRACTORS AND ELECTRICAL MAINTENANCE MEN

TYPICAL EXAMPLES OF WIREMOLD INSTALLATIONS THAT COULD • WIN FOR YOU •







Today . . . and in the near future . . . you are planning many jobs using Wiremold Raceways and Fittings in war plants, hospitals, schools, stores, offices and other types of buildings. All of these jobs are interesting to us and many of them will point the way to future Business-Building opportunities for you and your fellow electrical men. That is why we are announcing this Wiremold "How to Use it" competition . . . to record the best of these Wiremold applications for the benefit of all. Send now for folder giving full details of how to enter, and the few simple rules.

Awards will be made for those installations judged as showing business-building possibilities in a wide field, as well as good judgment in the selection and use of our products, bearing in mind the wide adaptability and interconnectability of Wiremold in completing the wiring system "FROM PANEL BOXES TO OUTLETS".

The judges shall be chosen from the electrical industry, and their decisions shall be final.

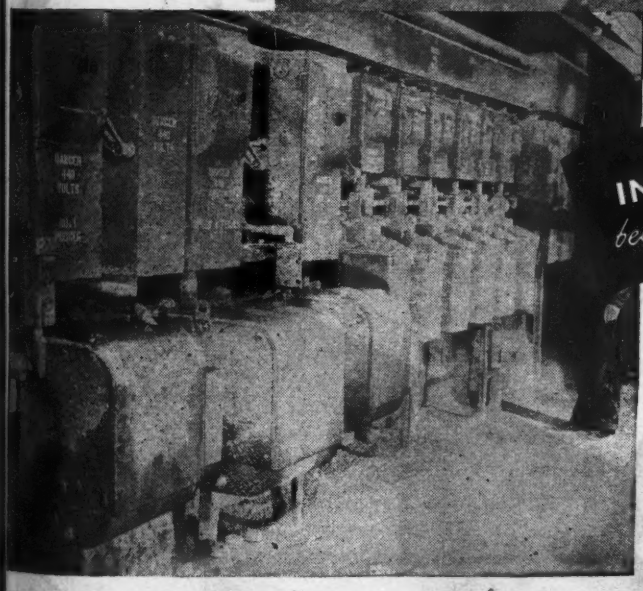
COMPETITION OPENS OCT. 1, 1945
AND CLOSES APRIL 1, 1946

THE WIREMOLD COMPANY, HARTFORD 10, CONN.

PERIODIC INSPECTION AND CLEANING... for cool, efficient operation of breakers and safety switches

EFFICIENT *because it's clean!*

Periodic inspection and cleaning keep these Westinghouse circuit breakers and safety switches spic and span —for efficient, *steady* operation... and higher production.



INEFFICIENT *because it's dirty!*

These safety switches are badly in need of a thorough house cleaning. Dust accumulations such as this prevent normal heat radiation and raise operating temperatures.

Westinghouse Recommends These Steps When Inspecting Safety Switches

1. Make sure disconnect ahead of switch is open.
2. Clean contacts, and check for alignment and proper pressure on hinge and break jaws. Apply light coat of sludge-free lubricant.
3. Remove and clean fuse contacts with fine sandpaper; check fuse ratings; tighten fuse contacts.
4. Clean switch base and insulating parts.
5. Make certain cable connections and lugs are tight.
6. Check switch for smooth operation, and clearance of arc extinguisher, safety shields, etc. Lubricate operating mechanism.
7. Keep cabinets clean and free from rust—and keep covers closed.

In the urgency of war production, inspection and cleaning of vital control, such as enclosed breakers and safety switches may have been overlooked. Because these are vital links in your plant power distribution system, Westinghouse recommends periodic inspection and "house cleaning".

Benefits are manifold: reduced maintenance, higher operating efficiency and safety standards, protected investment, and not least . . . increased production.

Safety switches and Type AB-I circuit breakers are only two items of the Westinghouse complete line of standardized control. For *any* control, call your Westinghouse office, or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-60604

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

AB-I BREAKERS AND SAFETY SWITCHES


Certified
FLEUR-O-LIER
CERTIFIED
CERTIFIED
in accordance
with Test
Requirements of
Specifications of
Fleur-O-Lier Manufacturers
ELECTRICAL TESTING
LABORATORIES, INC.
NEW YORK, N. Y.
Certifying Agent
...you
Certified Ballasts and
Starters are an important part
of Fleur-O-Lier Certification

WHEN FIXTURES WEAR THIS LABEL

...have lots of extra selling punch

For you can be sure that fixtures labelled Fleur-O-Lier are RIGHT! You can be sure of performance. You can count on trouble-free operation. And your customers know it!

Here's why:

1. Fleur-O-Lier certification is a protective service set up to help you and your customers. Over 30 leading fixture makers build fixtures that carry it. That means many sources of supply.

2. This label on a fixture means that it is built to definite authoritative specifications . . . to provide the best in lighting and lamp performance, together with dependable service.

3. It signifies that fixtures are subject to rigid test by Electrical Testing Laboratories, Inc., and are certified by them as meeting Fleur-O-Lier specifications.*

4. It brings you the knowledge and research of many of the finest technicians in fluorescent lighting.

And in addition—this label lets you choose from a wide variety of fluorescent fixtures designed to appeal to the taste and style needs of your customers—and be sure about quality!

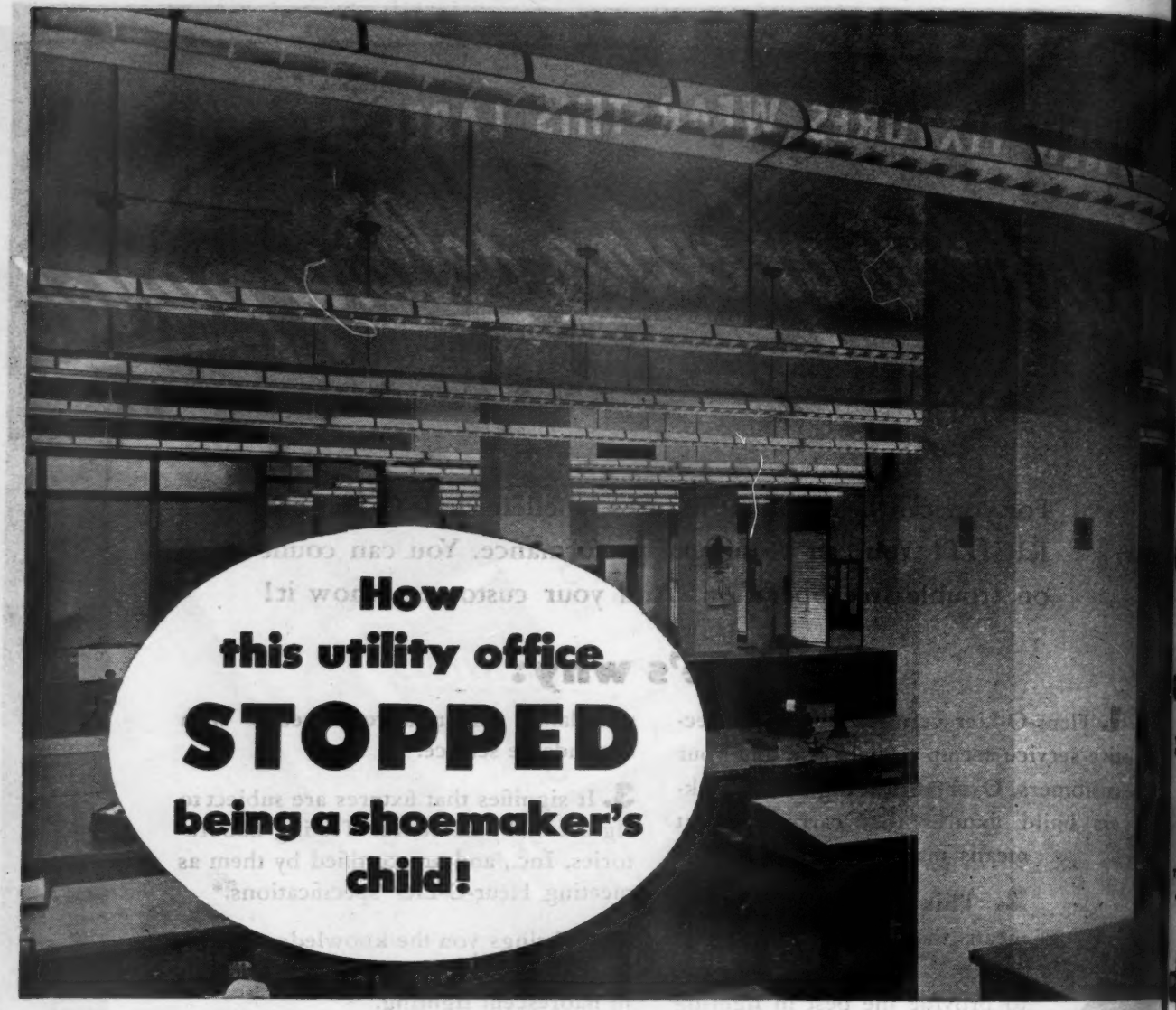
So when you're planning for tomorrow's fluorescent lighting sales, be sure fixtures marked Certified Fleur-O-Lier are part of your plans.

FLEUR-O-LIER

Manufacturers

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements



Wanted:

An office lighting installation to set a standard for other companies on Tampa Electric's lines—and incidentally to help on its own paper work.

Problem:

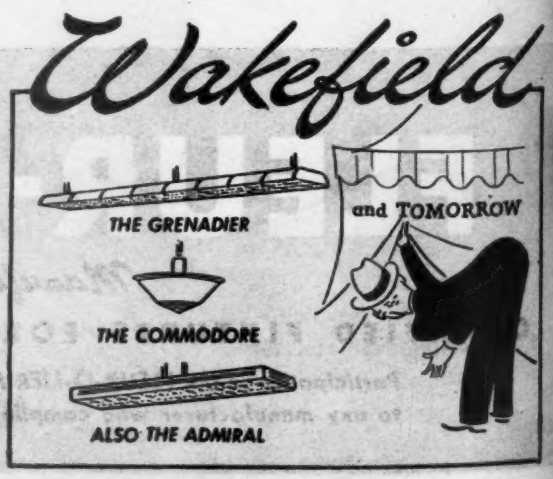
High quality, high level illumination . . . lighting as modern as the air conditioning then being installed.

Solution:

Tampa Electric chose continuous rows of Wakefield GRENADIERS (No. PG-2488) to provide plenty of cool light on desktops and diffused overall light throughout the room. They realized the importance of proper light on walls and ceiling, since this means less strain on eyes and a pleasanter place to work.

In this 40′ x 80′ room of the accounting department, 98 units were used in rows 7′ 9″ apart and 11′ above the floor (ceiling height 14′). Result: an average of 45 footcandles four months after installation.

Perhaps your customers' offices call for a different lighting treatment, different fixtures. You can be sure that Wakefield has the answer . . . and will be glad to work with you for engineered lighting performance. The F. W. Wakefield Brass Company, Vermilion, Ohio.



There are Switch and Circuit Breaker

CONDULETS

CONDULETS are made only by CROUSE-HINDS

to meet your every need.

The illustrations show a representative selection from the hundreds of different switch and circuit breaker CONDULETS—each designed for its special purpose, to help you do the job and do it right.

No. 2
of a series of advertisements which demonstrate that CROUSE-HINDS "complete line" means much more than just a range of sizes—there is a wide variety of highly specialized types in each classification.



Complete listings of each type are in Condulet Catalog No. 2500 or in supplementary bulletins.

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY

Syracuse 1, N. Y., U.S.A.

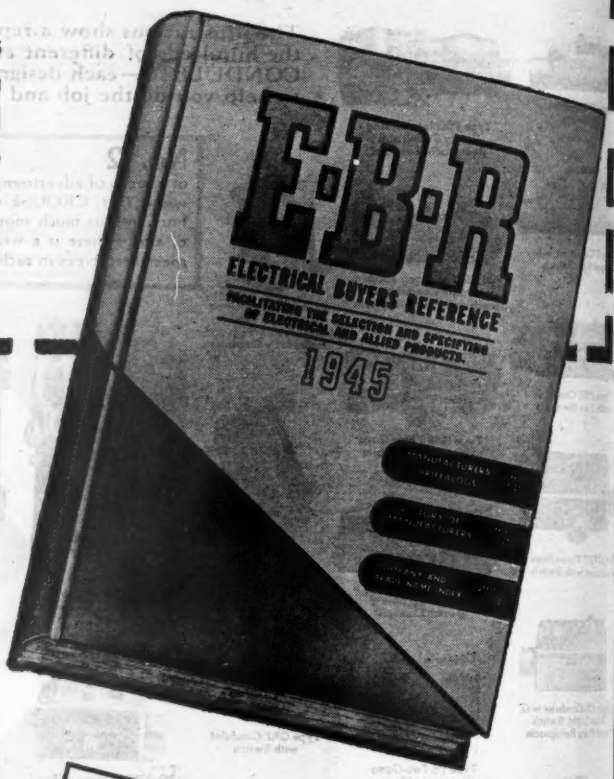
Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Kansas City — Los Angeles — Milwaukee — Minneapolis New York — Philadelphia — Pittsburgh — San Francisco — Seattle — St Louis — Washington. *Resident Product Engineers:* Albany — Atlanta — Charlotte

CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

What's in E-B-R?

E-B-R is *your* electrical reference. It is crammed with information you need in your daily work—information that will answer almost any question about *who* makes *what*. That's why it pays to "look it up first in E-B-R."



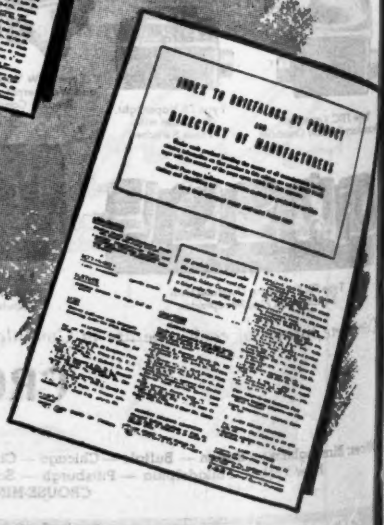


There is a Briefalog* Data on the Lines of 357 Manufacturers.



There is a Complete Index of all Electrical Manufacturers and all Trade Names.

There is a Detailed Directory of all Electrical Products, and Who Manufactures Them.



You will find all this information ONLY IN

E-B-R

Use it—TODAY AND EVERY DAY

*Briefalog—E-B-R's own original version of modern condensed catalogs

Published by

McGRAW-HILL PUBLISHING CO., INC.

330 WEST 42nd STREET • NEW YORK 18, N. Y.



KNOWING WHERE TO LOOK

A BUSY electrical contractor doesn't have to look far and wide to locate all the materials he needs for any and every installation job he tackles.

All the materials are within easy reach, no further away than a nearby T&B Electrical Wholesaler.

There he will find the most complete source of electrical material and supplies, and practical electrical knowledge and information that we know of. We speak from nearly half a century of experience as Electrical Manufacturers.

Naturally it is to our interest to put our products into the hands of ultimate users, with the utmost economy. For that reason we distribute all T&B products exclusively through the most economically sound channel—the competent service organizations of T&B Electrical Wholesalers.

The green light is coming on. Order from your T&B Distributor the T&B wire and cable fittings you need for reconversion and new construction. For example, the famous Lock-Tite Line of Pressure Solderless Connectors that will economically handle 90% of your ordinary wiring jobs with ease and speed.

Have you any unusual ticklish wiring job? Let our Engineering Department come up with a practical solution for you. For this free service address our home office, or any T&B field office listed in the telephone books of leading cities.

THE THOMAS & BETTS CO.

Incorporated

Manufacturers of Electrical Fittings Since 1898

ELIZABETH, N. J.

FOUR-STAR E AWARD

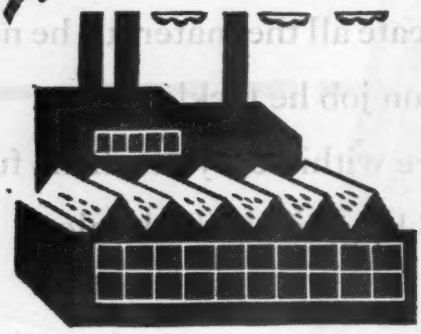
what the PAYROLL SAVINGS PLAN *means*

To you

To your Industry

and your Employees







Facts and figures prove **the Payroll Savings Plan to be a tremendous national asset. Through this plan, no less than 27,000,000 workers have so far saved more than $13½ billions to help speed victory . . . forestall inflation . . . and build peacetime prosperity!**

Did you know that yours is one of 240,000 companies maintaining a Payroll Savings Plan? Not only is this combined effort fostering national security, but also creating a lucrative postwar market for you . . . and all American industry!

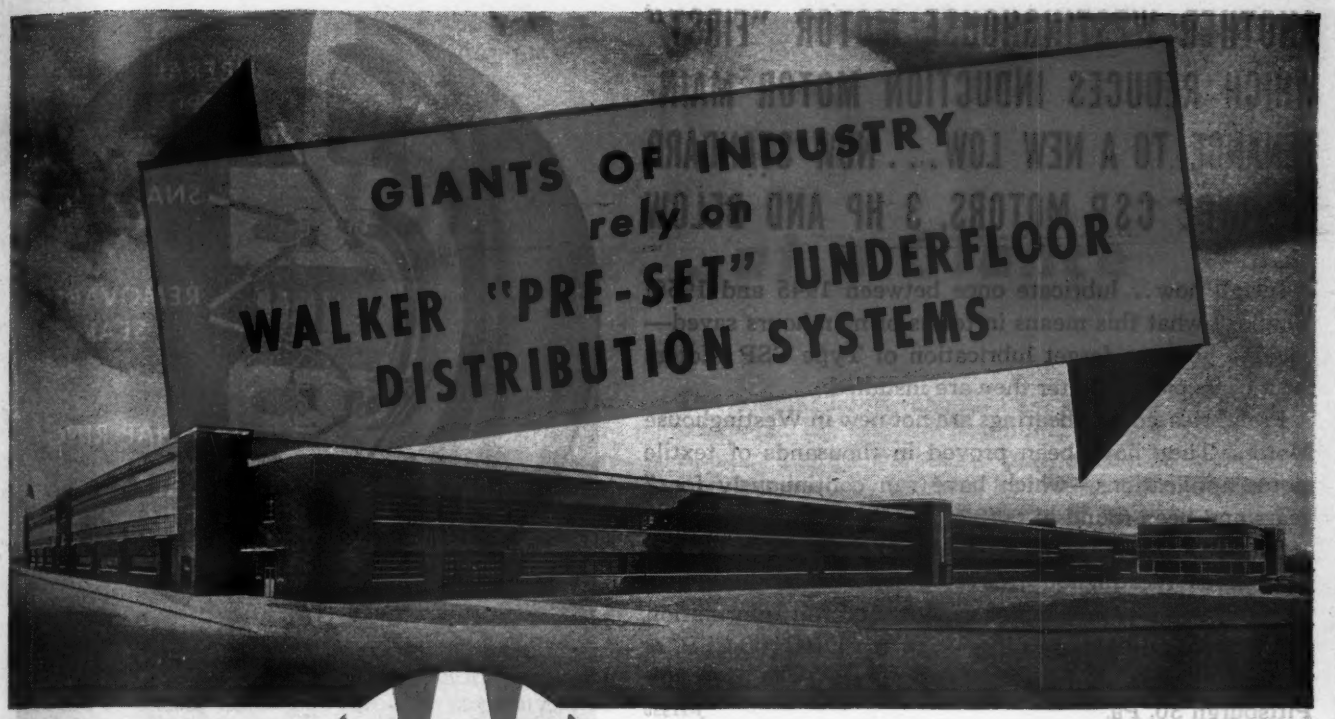
Have you realized that 76% of all employed in industry are now enrolled in the Payroll Savings Plan . . . averaging a $25 bond each month per employee? Through this plan, millions are now looking forward to homes, educational opportunities and old age independence!

Surely, so great an asset to your country, your company and your employees is worthy of your continued . . . and increased . . . support! Now is the time to take stock of your Payroll Savings Plan. Use selective resolicitation to keep it at its 7th War Loan high! Keep using selective resolicitation to build it even higher!

The Treasury Department acknowledges with appreciation the publication of this message by

ELECTRICAL CONTRACTING

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council



• The Great Willow Run Plant of the Ford Motor Company ☆

WIRE WITH WALKER

• The Famous Fisher Building in Detroit ☆



PROOF . . . of Walker superiority . . . is the choice of Walker "Pre-Set" Underfloor Distribution Systems to function in the great Willow Run Plant of the Ford Motor Company in their Airplane Parts Manufacturing Building, their Hangar Building and their Airplane School Building and in the towering Fisher Building, Detroit landmark.

The complex problem of coordinating the maze of power, light, telephone and signal circuits in this streamlined bomber plant and this modern office building is handled simply, permanently and efficiently by the Walker installation.

A network of single or multiple ducts provides concealed steel raceways for wires of the various services from the centers of distribution to the desired locations on the floor surface. Convenient outlets may be quickly installed, or removed, to serve almost any point in the floor area. In this way, changes in office or plant layout can be easily and speedily accommodated.

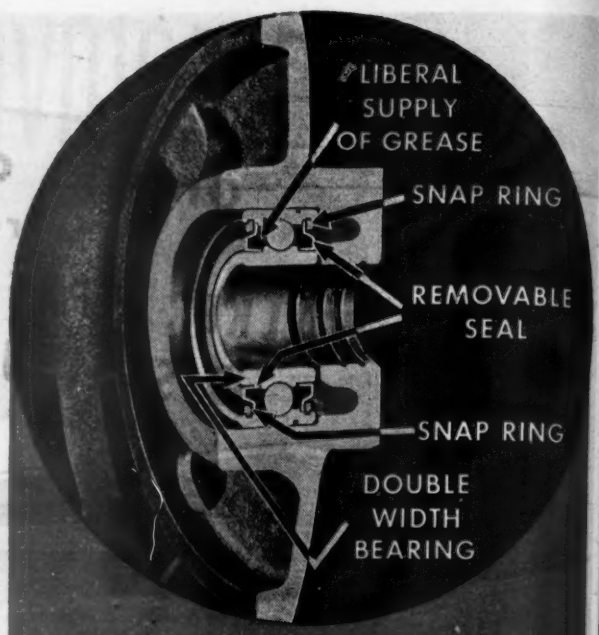
FOR FURTHER INFORMATION, see Sweet's Catalog or consult our local representatives. We will gladly cooperate with your architects or engineers in designing a system to meet your particular requirements. Address WALKER BROS., Conshohocken, Pa.

☆ Both Buildings designed by Albert Kahn, Associated Architects and Engineers, Inc., Detroit

WALKER of Conshohocken

Makers of Rubber-covered, Synthetic and Leaded Wires and Cables * "Walkerflex" Non-metallic Sheathed Cables * Service Entrance Cables * Automotive Wires and Cables * Shipboard Cables * Leaded, Non-Leaded; Synthetic or Varnished Cambric Insulation * Electrical Metallic Tubing * "Duraduct" Rigid Steel Conduit * "Power-Insert" Underfloor Distribution Systems

ANOTHER WESTINGHOUSE MOTOR "FIRST" WHICH REDUCES INDUCTION MOTOR MAINTENANCE TO A NEW LOW... NOW STANDARD ON TYPE CSP MOTORS, 3 HP AND BELOW



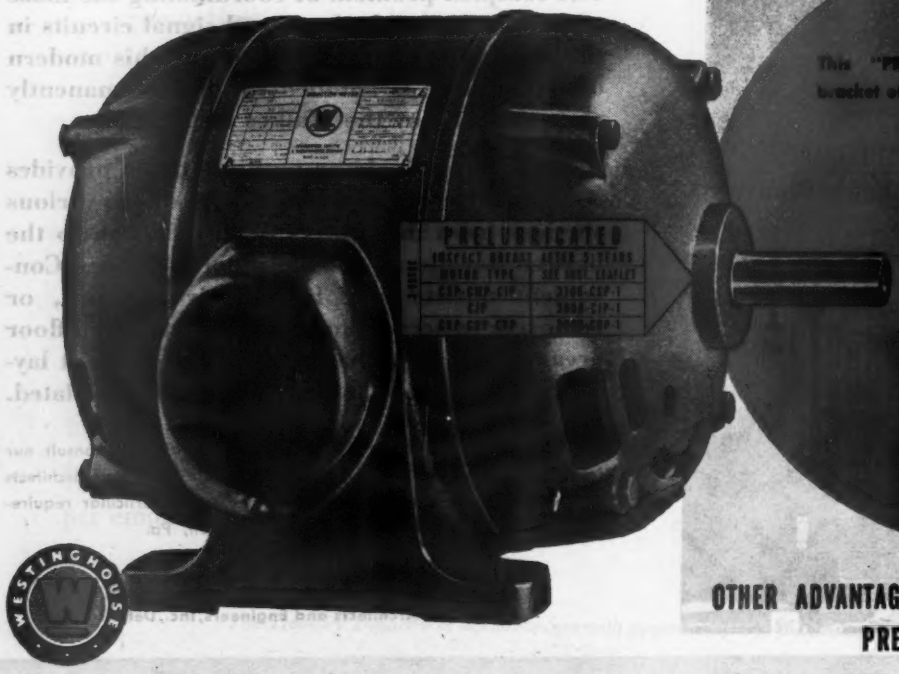
Install now... lubricate once between 1945 and 1955! Think of what this means in terms of man-hours saved—because you can forget lubrication of Type CSP Motors for *5 years* or more after they are installed.

Prelubricated ball bearings are not new in Westinghouse Motors. They have been proved in thousands of textile motor applications—which have run continuously for 7 years and been found in perfect condition after that time.

The CSP motor is another example of the extensive and continuous Westinghouse developments which have contributed to induction motor design. For full information, call your Westinghouse office—ask for DB-3100-CSP, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-21330

only ONE lubrication...

BETWEEN 1945 AND 1955!



This "PRELUBRICATED" label (on end bracket of all CSP motors up to frame 225) your assurance of:

- No overgreasing
- No misplaced plugs
- No grease seepage into windings
- No "chipped" bearings
- No grease contamination
- Simplified lubrication schedules

OTHER ADVANTAGES OF WESTINGHOUSE TYPE CSP PRELUBRICATED MOTORS

- Longer grease life
- TUFFERNELL Insulation
- Die-cast Rotor with oversize fan
- Dynamically Balanced Rotor
- Liberal Through-Ventilation—air enters front and leaves at drive end of motor

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

TYPE CSP MOTORS

SEPTEMBER . . . . at a Glance



The shield shown here is worn as a lapel button by honorably discharged members of our armed forces. It is a symbol in which we should all be interested and one that we should all recognize. And right now it would be well to check up again on your local programs for absorbing returning veterans into the electrical industry. The way is pretty well set for those who are returning to their old jobs, but by far the greater majority will be men seeking new careers.

★

In October every year we usually blossom out with something special about lighting. Next month's issue will bring one of the most elaborate and downright useful editorial projects we have developed in many years. In a special section on Planned Lighting, we are bringing together the advanced lighting techniques of several top ranking illuminating engineers and it's all practical, down-to-earth stuff.

★

With quantities of plans and specifications coming out in the next few months for figures, we are starting a series of thoroughly up-to-date articles on estimating to begin next month. Ray Ashley, Research Engineer for the Chicago Electrical Contractors' Association, is the author. He will need no introduction to readers of this publication, as his authoritative work has brought us useful estimating data for many years.

★

In conjunction with B. C. Cooper's lighting techniques article this month we have obtained a thorough-going market analysis of potential lighting business in theatres and amusement centers. J. Harry Toler, of BOXOFFiCE magazine, has developed some interesting figures on the market potential. You'll find his article on page 76.

The atomic bomb ushers in a new era in man's conquest of his environment. The impact of atomic energy in social and economic spheres may not be fully realized for years, even decades. Obviously, the new development is of vital concern to everyone. A special editorial insert in this issue is devoted to a technically accurate description and a realistic analysis of probable future developments in the field of atomic power.

★

Frontier of reconversion, Detroit is also the center of labor strife and jurisdictional problems brought on by the impact of peace. The CIO-AFL controversy over in-plant wiring required for change-over is nothing new. It has been brewing for years. Gus Eckel dug into the background and sought out labor leaders in the auto center to give us an accurate, unbiased and objective report. You will find it on page 80. The labor history that will be written in Detroit during the next few months can set important precedents that will be felt across the nation.

★

Glen Rowell's recent article "Safety in the Operating Room" has stirred up plenty of comment. Howard Pancoast of Bryant Electric Company in High Point, N. C., suggested it be brought to the attention of hospital designers and builders in some way. Here's a way. We have a goodly number of reprints. They are available to you without charge. Order some and pass them along to your local architects and hospital authorities.

★

Action of the Electrical Committee on revision of the National Electrical code is slated for a meeting in Chicago on October 8 now that meeting regulations are to be modified. This is the meeting that had to be called off in May. The agenda of article committee recommendations is one of the largest ever tackled by the Committee.

Announcing AMER-TRAN *Ballasts*



A NEW PRODUCT OF 40 YEARS' SPECIALIZATION

Having specialized in the design and manufacture of transformers for over 40 years, AmerTran now places its name on another transformer product. Complete research and manufacturing facilities have been combined to make this, the AmerTran Ballast, a superior product.

AmerTran Ballasts are matched exactly to lamp characteristics and designed to meet all safety standards. Efficient, quiet, easy to install, they promote longer lamp life and minimum maintenance. You can recognize the AmerTran Ballast by its distinctive roll-turn leadout that prevents strain on lead insulation and makes wiring easier.

AMERTRAN

MANUFACTURING SINCE 1901 AT NEWARK, N. J.

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

AMERICAN TRANSFORMER CO. — 178 Emmet St., Newark 5, N. J.



IT IS with much pleasure that I announce the appointment of Lee H. Hill as publisher of *Electrical Contracting* and *Electrical World* to succeed William K. Beard, Jr., who has been advanced to the post of vice-president in charge of advertising activities for the McGraw-Hill Publishing Company.

Lee Hill brings to these papers an unusually diverse experience in the electrical industries. Educated as an electrical engineer, well grounded in the technical phases of the industry with Westinghouse and American Brown-Boveri, his 14 years with Allis-Chalmers have rounded out his understanding of the whole broad electrical field—engineering, design, development and sales. He has also contributed to its technical progress through his writings on a variety of subjects.

As we get deeper into a period when industrial relations must claim a mounting share of attention from engineers and industrialists, Mr. Hill takes over his publishing responsibilities well equipped on that score. Four years ago he was elected by Allis-Chalmers vice-president in charge of industrial relations. In that capacity he has developed for his company a forward-looking program of employee compensation and training, safety, medical and other employee services. During the war he served as an industry member of the National War Labor Board.

Lee Hill is no stranger to McGraw-Hill, for he is co-author of its recently published book "Management at the Bargaining Table." I am confident that in his new capacity he will bring to the electrical industries the kind of responsible and forward-looking leadership that has been the consistent purpose of these publications throughout their long years of service to them.

James H. McGraw, Jr.

Full production will need full power . . .

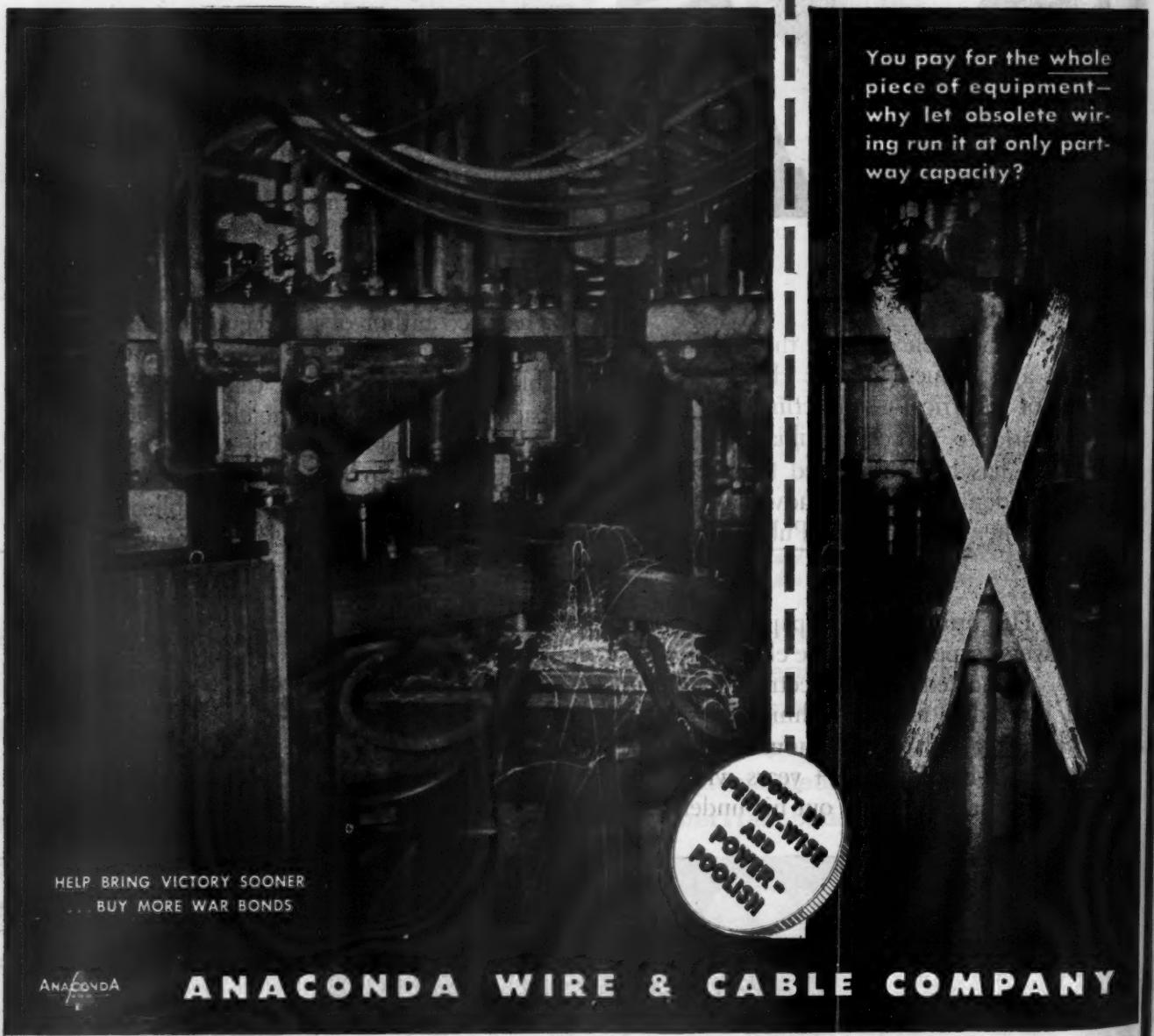
Wire ahead!

DO YOU KNOW how badly inadequate wiring can reduce the efficiency of advanced electrical equipment? From twenty-five to fifty per cent! Check your postwar plans now. Make sure wiring, service equipment, keep pace with your production hopes.

Wiring based on past standards won't do it. Wiring based on future power needs *will* do it. Certainly it will be a lot cheaper to change blueprints than face expensive alterations later.

Talk that over with your consulting or plant power engineer—your electrical contractor or power salesman. They'll confirm the logic of *foresighted* wiring in postwar plans. Anaconda Wire & Cable Company, Subsidiary of Anaconda Copper Mining Company. General Offices: 25 Broadway, New York City 4. Chicago Office: 20 North Wacker Drive 6. Sales Offices in Principal Cities.

Because of the basic importance of adequate wiring to the entire electrical industry, Anaconda is presenting messages like this in a wide list of national publications.



TIME FOR REASON

If we want to install a good explosion-proof wiring job, or lay out the lighting for a clothing factory we approach it as an engineering problem. We bring to bear experience and reason and sound judgment. We quickly and confidently resolve serious and difficult problems of economy, permanence, ease of maintenance and the like. Knife edge perfection is rarely realized. Nor is it especially sought.

In our approach to labor problems and in labor's approach to its own problems there is urgent need for equally confident and objective reasoning as we swing over to a peacetime economy. Welded by the universal task of winning a war, it was comparatively easy to resolve differences and compromise demands. Can we expect similar allegiance to the common cause of economic growth and full employment to confound the hotheads and soften the counsellors of perfection in the days ahead?

The present jurisdictional controversy between CIO and AFL unions in Detroit is a case in point. Though the claims seem almost irreconcilable, basic differences are neither very great, nor, in an atmosphere of reason and sound judgment, particularly difficult to settle. And even more important, the real issues at stake are not worth one hour's delay in the vital task of industrial reconversion. Here on a relatively small scale is a great test of labor statesmanship, a preview of labor's role in the enormous economic task ahead. An amicable and reasonable solution will stimulate a confident and courageous approach to the new economy ahead.

Reason must prevail too on overtime rates in the swing from government to private work. An immediate return to double time would bring "penalty" rates at a time when labor is still scarce. It would drain some of the essential conversion jobs, slowing down the job-making projects which must have priority if we hope to absorb the cutback of war work. Double-time rates have always been a device to spread work and discourage overtime. To return to them now from the prevailing time and a half might momentarily increase take-home pay on private work but would tend to speed a return to the straight time work week.

The future of a sound apprenticeship program will also depend upon a courageous and reasoned appraisal of the growth of electrical construction, installation and maintenance. Good mechanics cannot be pried out of the woodwork to meet the need of the moment. An over-cautious approach counseled by fear of unemployment might appear to be good insurance against overcrowding the ranks. But shortage brings in men of indifferent training and uncertain skill, a lowering of standards that seriously impairs the skilled workman's "investment" of training and experience. Momentary uncertainties should not be allowed to slow down the sound apprentice program which is getting underway.

If we can set our sights toward practical and reasonable solutions of labor issues, if we can shove aside the fears of irretrievable precedent, if we can reject the temptations of personal ambition, labor and management together can carve out a great destiny for their industry. There are no internal problems great enough to warrant a moment's hesitation in facing squarely the opportunities and challenges that lie ahead.

Wm. T. Stuart

Electrical Contracting

SEPTEMBER, 1945

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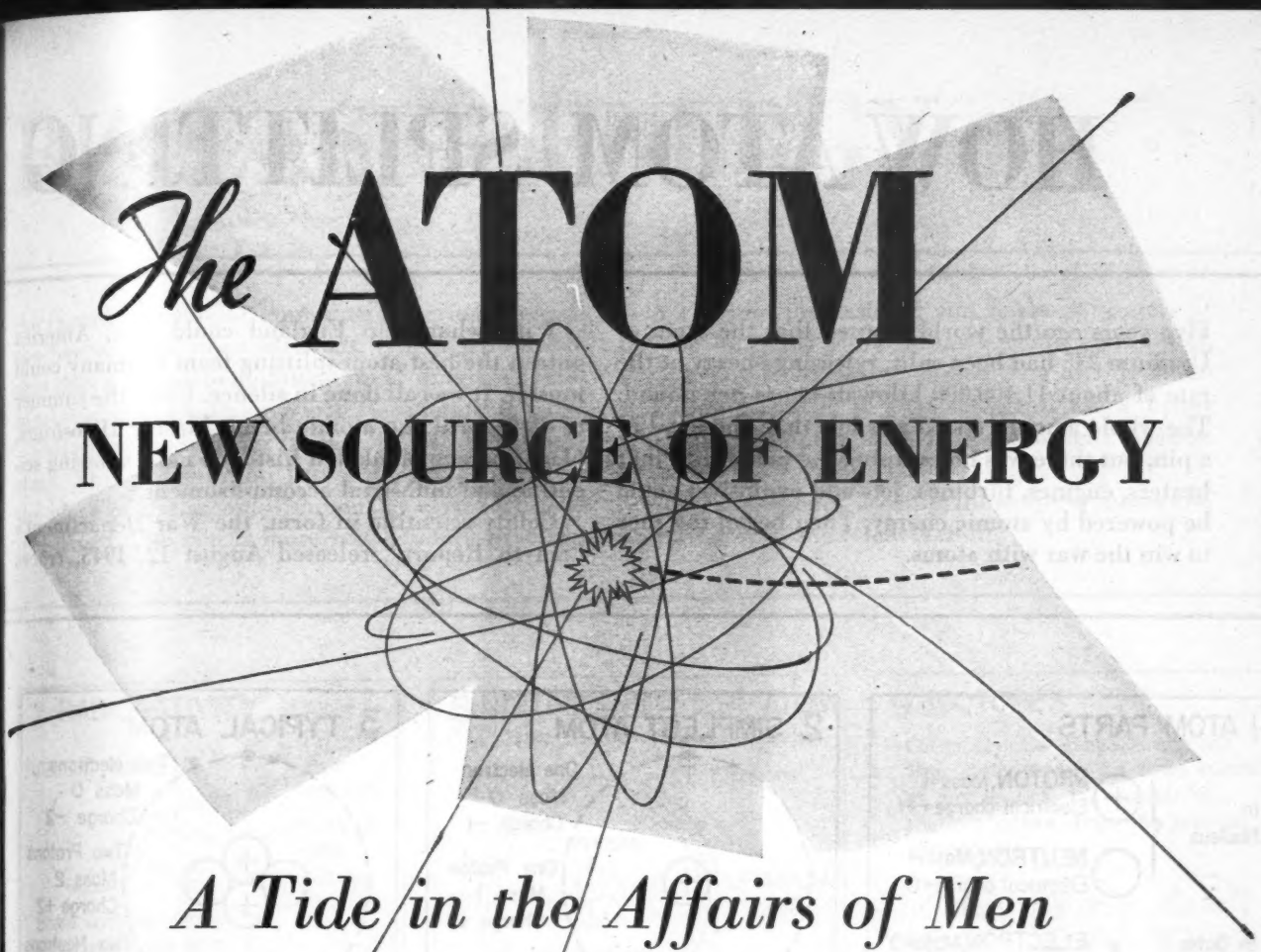
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ADEQUATE WIRING — THE KEY TO THE HOME OF TOMORROW

The ATOM
NEW SOURCE OF ENERGY



A Tide in the Affairs of Men

On August 6, 1945, an atomic bomb exploded over the Japanese city, Hiroshima.

Its concussion blasted the city, vaporized the fibre of Japan's will to resist, and flashed across the world a light of such glaring intensity that even blind eyes could glimpse the forked road that is presented to humanity's choice and destiny.

It has been a scant fifty years since Pierre and Marie Curie embarked upon their research with the avowed intent of discovering "how the atoms of the universe are put together". Their work contributed radium to the knowledge and use of mankind, but it marked only a way station upon the awesome quest which they announced and which thousands of scientists have since pursued.

Under the compelling stimulus of war, the first major application of the release of atomic force has been in an instrument that raises by an unimaginable dimension our ability to dole out death. We can be devoutly grateful that the scientific leadership of the Allies, and particularly the industrial strength of the United States, brought to us, rather than to our enemies, priority in the development of this dread weapon. But even in its present infant phase, it is clear that ownership of the principle of the atomic bomb carries a trusteeship of terrifying gravity.

We hold in trust a power that is capable of unraveling the very fabric of our civilization. Equally, it may be susceptible of development as a mighty force for human welfare. But we have proved the destructive use, while the constructive applications are still in the realm of speculation.

Clearly the trust is of a magnitude that transcends national jurisdiction. No walls have ever been built high enough to fence in the spread of scientific knowledge, and even if we were resolved to forego the harnessing of atomic power for peace, it is hopeless to think that its application for war can be held for long as the monopoly of one, or a small group of nations.

At one giant stride our scientific and technological development has so far outdistanced our social engineering, that we have no choice but to turn our full powers of creative imagination to control the forces we have unleashed and to bend them to man's use rather than to his destruction.

Since control is not possible without understanding, I have asked several of my editorial colleagues in the McGraw-Hill organization to present on the pages which follow a non-technical but authoritative account of the known facts and implications of atomic power.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

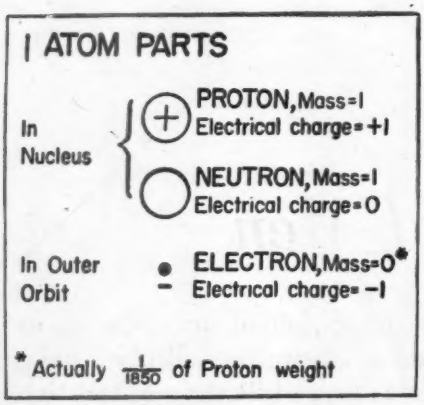
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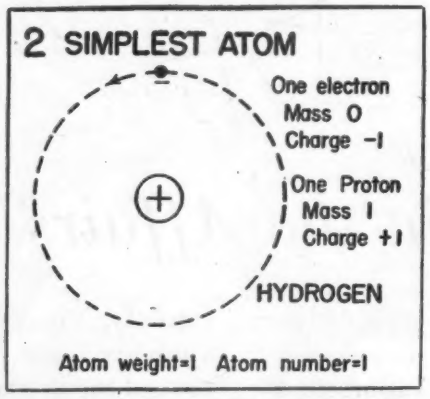
HOW ATOM SPLITTING R

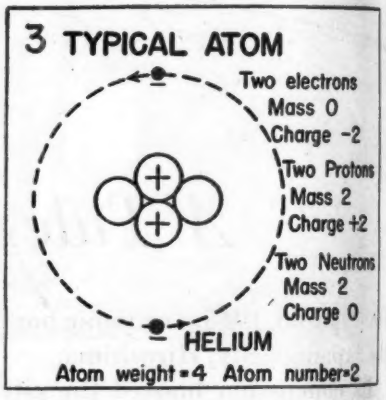
Five years ago the world learned that the atom of Uranium 235 had been split, releasing energy at the rate of about 11,400,000 kilowatt-hours per pound. The whole amount tested was less than the head of a pin, but there was no escaping the possibility that heaters, engines, turbines, jets and explosives could be powered by atomic energy. Then began the race to win the war with atoms.

With what help England could give, America outran the best atom-splitting team Germany could muster. It was all done in silence. From the summer of 1940 until the atomic bomb blasted Hiroshima, black secrecy blanketed history's most amazing scientific and industrial accomplishment.

Coldly scientific in form, the War Department's "Smyth Report," released August 12, 1945, traces

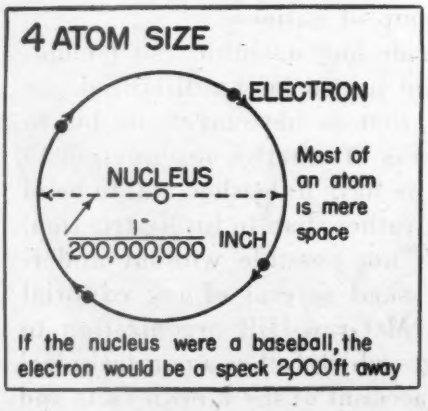


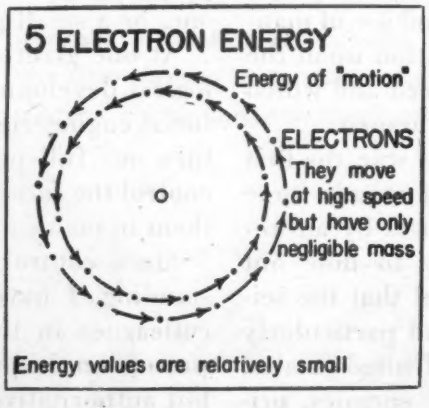


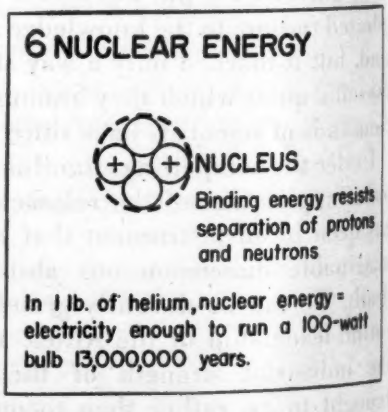


Each of the 92 elements has its own *atom*, yet all atoms are made from the same three pieces, Fig. 1: *proton* (weight 1, electric charge +1), *neutron* (weight 1, charge 0), *electron* (weight 0, charge −1).

Every atom is a tiny "solar system." Its central "sun" has one or more protons, generally neutrons too. The revolving "planets" are electrons, one for each proton in nucleus, because plus and minus must balance in the atom. The opposite charges attract, but high speed keeps the electrons out in their circular orbits, just as the centrifugal tendency of the revolving earth defies the sun's gravitational pull. All the weight of an atom is in the nucleus, so add the number of protons and neutrons to get the atom's weight. The *atomic number* is equal to the number of protons. The elements are known by their atomic numbers. Thus uranium (92 protons) is element 92.







With only their outermost orbits touching, it would take half a million atoms to span the thickness of a human hair. Yet if one could expand an atom until its outer orbits encircled 100 acres, the nucleus would be no bigger than a baseball. The atom is mostly empty space, Fig. 4, and nuclei are difficult targets; so much so that a neutron bullet fired at a mass of atoms may pass right through without a hit.

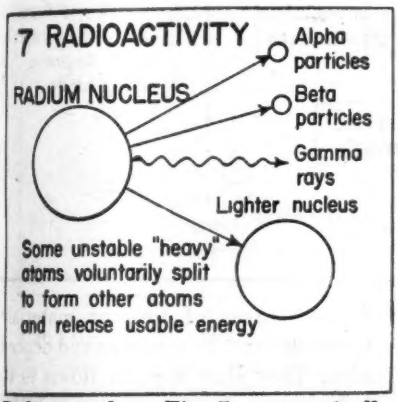
The almost weightless speeding electrons, Fig. 5, supply all the energy of chemical reactions (as when coal burns or TNT explodes). Evading all ordinary chemical action, the immensely greater energy bound up in the nucleus, Fig. 6, can be released only by direct hits on the nucleus to break the bonds that hold the protons and neutrons in a tight bundle.

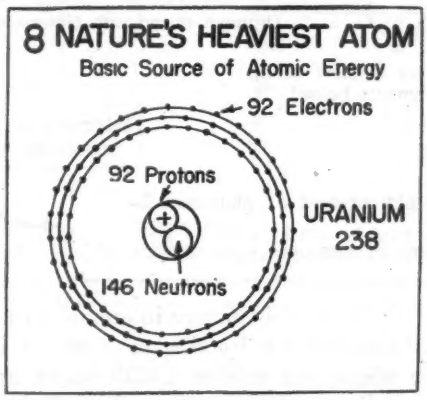
RELEASES ENERGY

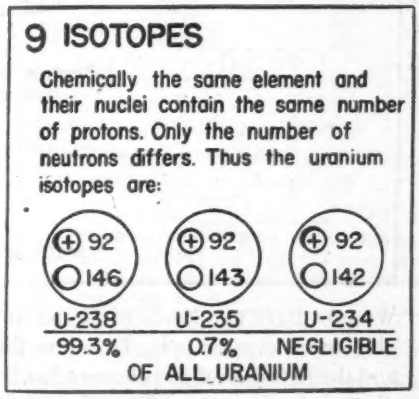
the fantastic course of atomic engineering through the five years of news blackout. It leaves no doubt that only a complete mobilization of America's technical resources could have won this victory in time.

Other writers in other places will unfold the epic story. This presentation leaves no space to reflect the glory of the accomplishment or even to record its history. The aim is more immediately practical — to give the professional and business readers of the McGraw-Hill publications a sound and honest, though non-technical, understanding of this atom-smashing business, so that they will know better what to do about it in their personal and business lives.

Now for step one: learning the shape of atoms and how atom splitting releases energy.

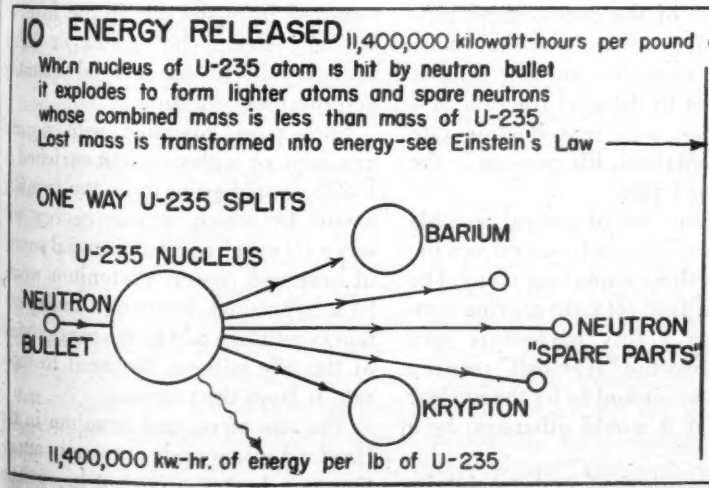


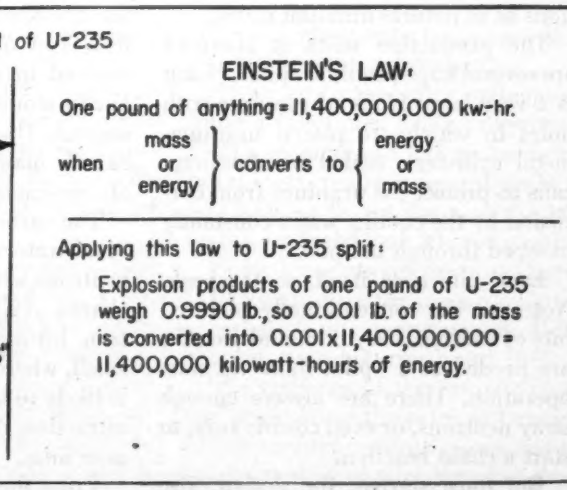




Radium nucleus, Fig. 7, automatically emits particles and energy as it decays to form nuclei of a lighter atom. Most common form of uranium, nature's heaviest atom, is Uranium 238, Fig. 8. This form is not directly useful for energy release, but is important as the raw material for a new synthetic power atom, *plutonium*.

An element may have several *isotopes* — alternate forms with the same number of protons but slightly different numbers of neutrons. Uranium 238 is the isotope in which protons and neutrons total 238 (so atom weight is 238). It is 99.3% of the total weight of pure, natural uranium. The stuff needed for direct atomic-energy release is Uranium 235, only 0.7% of the total weight and very difficult to separate from 238. To put it another way, every pound of energy-giving U-235 comes mixed with a dead load of 140 pounds of relatively inert U-238.



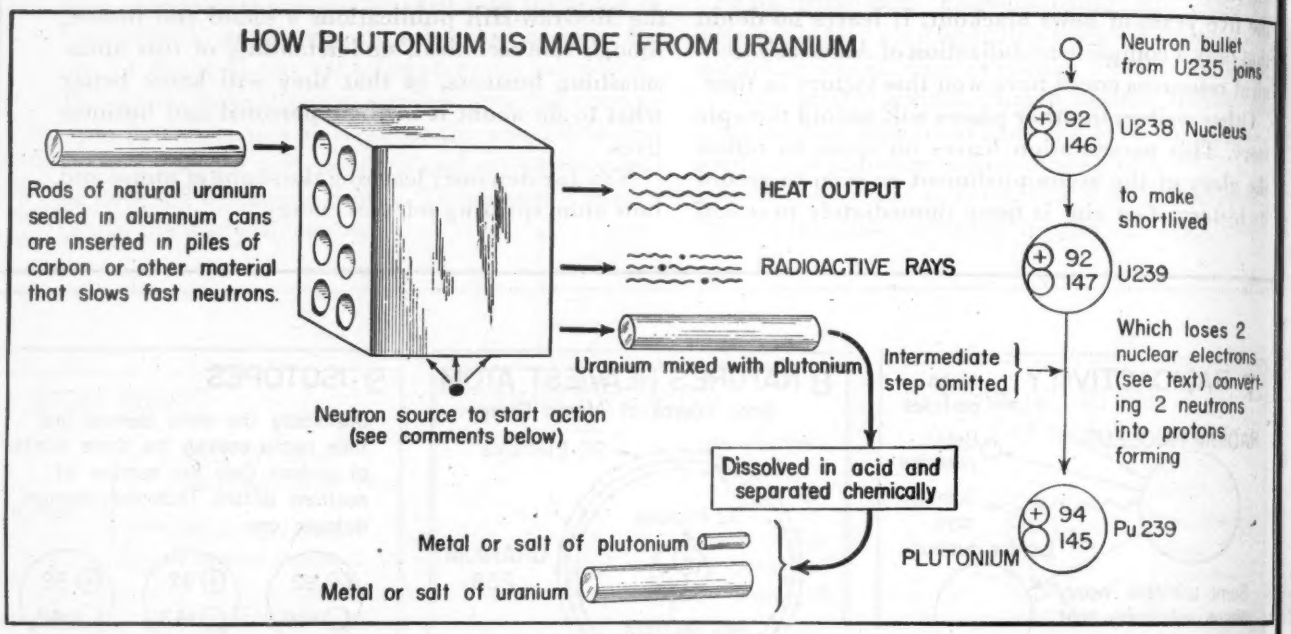


Slow neutron bullet splits Uranium 235 nuclear target, generating two lighter atoms (Fig. 10 shows one possibility) and several free neutrons ready to split other U-235 atoms. The following pages show how the original neutron may be produced and directed and how a chain of self-propagating atomic explosions may sweep through a block of U-235 like a forest fire to release heat energy equivalent to 11,400,000 kilowatt-hours per pound.

CONTINUED ON NEXT PAGE

CREATING and ISOLATING

Man-Made Plutonium—U-235 Substitute



We now have two kinds of atoms suitable for energy supply, Uranium 235 and the new man-made element No. 94, plutonium. Uranium, No. 92, has the heaviest atom of any natural element.

The Manhattan Project's plant, on the Columbia River at Hanford, Washington, is the world's greatest atom-making factory. Devoted entirely to the mass production of plutonium atoms, it uses U-238 as the raw material and U-235 as the energy source, intimately mixed in the same proportions as in natural uranium metal.

The production units at Hanford are several huge uranium "piles." Each is a very large block of graphite with holes in which are placed uranium-metal cylinders, sealed in aluminum cans to protect the uranium from corrosion by the cooling water constantly pumped through the pile.

Each pile runs itself, so to speak. Not even the conventionally pictured bits of radium, beryllium and paraffin are needed as a "pilot light" to start operation. There are always enough stray neutrons, or even cosmic rays, to start a chain reaction.

But once started, the design, size and control of the unit must be such that the chain reaction will continue at an even rate — neither die down nor overshoot into an explosion.

To see this picture in atomic terms, consider the fraction of a second in which one million U-235 nuclei are split, producing two million lighter atoms (say, one million of barium and one million of krypton) and between one and three million fast-moving neutron projectiles.

Some of these escape in free flight right through the relatively vast atomic "open spaces." Some are "captured" by the many U-238 nuclei, and others are captured by the impurities. But, on the average, of the one to three million, just one million neutrons must succeed in smashing another million U-235 atoms in the next fraction of a second. Thus, with reproduction rate exactly maintained, life goes on in the atomic-energy pile.

The carbon, one of several possible "moderators," serves to slow down the neutrons without capturing many. The chance of a fast, straight-moving neutron hitting a tiny nucleus is very small, whereas the "slow ball" neutron is likely to be sucked in by the nuclear attraction if it would otherwise be a near miss.

From the practical angle, maintaining a chain reaction requires careful design and good controls. The pile must be slightly larger than actually necessary for a chain reaction (that means scores of tons of material). Controls must be sensitive and dependable. They slow the pile down to the balancing point by sliding in retarders, such as strips of cadmium.

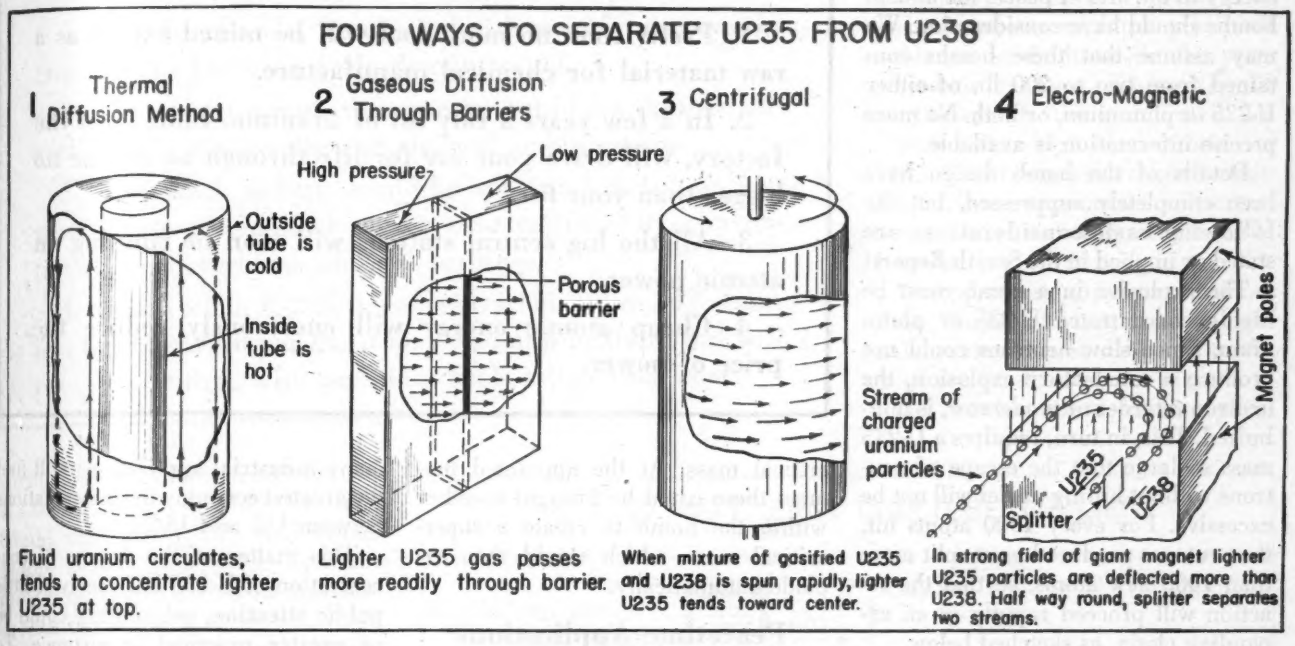
As already noted elsewhere, the energy released is about 11,400,000 kilowatt-hours for each pound of U-235 split. This energy appears first in the high speed of the pieces thrown off by the atomic split, then is converted to sensible heat as collisions slow down these projectiles. The energy is finally removed from the pile in the form of hot air, steam, hot water or other heated fluid in commercial quantity and thermal condition.

Such piles, operated with normal uranium, or with uranium enriched in U-235, would seem to be the primary means by which atomic energy will serve (if ever) as a commercial source of heat and power. Plutonium would be a byproduct, but might under certain conditions add to the energy yield of the pile without the need to separate it from the uranium.

The use of normal uranium in the Hanford pile sounds extremely attractive as a heat source, but has certain economic disabilities. Only a small part of the U-235 is used up before the pile must be shut down to remove the plutonium.

THE HIGH-POWER ATOMS

Isolating U-235 — a Gigantic Task



Many of the uranium ores, including most samples of pitchblende and carnotite, will yield from 1 to 15% metallic uranium. Chemical separation of the metallic "natural" uranium is simple. Whatever the source, natural uranium contains the three isotopes in the constant proportions of 99.3% U-238 and 0.7% U-235, with traces of U-234.

Separating the U-235 from U-238, an operation essential for explosive uses of U-235, and probably important for future commercial controlled-chain piles, has been most difficult. Chemical separation was impossible because U-235 and U-238 are chemically the same.

The only possibility was a separation by physical differences, primarily a one percent difference in weight. The porous barrier and centrifugal methods pictured above required vaporizing a salt of uranium. All the methods shown have been used or tried on the Manhattan Project. All require many stages to achieve a substantial concentration of Uranium 235.

Dollarwise Thoughts on Atomic Energy

Costs mean little in war, but peacetime uses of U-235 and plutonium must pass the dollar test in competition with coal, fuel oil, natural gas, gasoline and electricity.

On the basis of energy costs only, *"all other things being equal,"* the table on the last page of this section shows at what price per pound U-235 would give the same energy cost as conventional energy sources selling at the indicated prices. For such comparisons it is convenient to remember that one pound of U-235 is equal (energy-wise) to about 11,400,000 kilowatt-hours, also to 1500 tons of coal, or 200,000 gallons of gasoline.

Fuel engineers understand the limitations of such oversimplified comparisons. Others should be warned that "all other things" are never equal. With this thought in mind, reconsider the uranium piles operated at Hanford to produce plutonium. These use U-235 in the cheapest form, say about $1400 per lb., assuming purified normal uranium at $10 per lb. (140 lb. of uranium contains one pound of U-235.)

If this were the whole story, coal would have to sell for a dollar a ton to break even with U-235 as a water heater. However, the pile using normal uranium must be immense to hold its own in a chain reaction. More important, the accumulating fission products "poison" the reaction after only a small part of the U-235 has been used up. Then the uranium cylinders must be removed for plutonium recovery. Finally, it has not yet been found possible to operate the normal-uranium piles at high enough temperatures for practical power production.

If we go to the other extreme and build a small pile, using concentrated U-235, we shall run into excessive material costs, perhaps several times the $52,000 per lb. set down in the table as the equivalent of 20-cent gasoline.

Something between the two extremes is likely to prove the most economical — perhaps a pile operating on a U-235 concentration between 1 and 10%.

The engineer of the "atomic-power age" must know the price of Uranium 235 *in various concentrations* and the characteristics of piles suited to them. No such information is yet available. He must also watch the danger from radio-activity; the requirements for radiation shields; explosion hazards, etc.

CONTINUED ON NEXT PAGE

WHAT TO EXPECT

Before discussion of possible and probable future applications of atomic energy to the arts of peace, the atomic bombs should have consideration. We may assume that these bombs contained from two to 200 lb. of either U-235 or plutonium, or both. No more precise information is available.

Details of the bomb design have been completely suppressed, but the following basic considerations are stated or implied in the Smyth Report:

The explosive in a bomb must be highly concentrated U-235 or plutonium. Since slow neutrons could not produce a satisfactory explosion, the neutron retarder or *moderator*, is minimized. This, in turn, requires a U-235 mass so large that the escape of neutrons without hitting nuclei will not be excessive. For every 1000 atoms hit, the neutrons produced must split more than 1000 new atoms, so that the reaction will proceed rapidly in an expanding chain, as sketched below.

There can be little leeway in the size of the explosive charge. For a given shape there is a certain "critical" weight of material. If this is exceeded the bomb explodes instantly. If the weight of charge is less than the critical, it cannot be made to explode.

Therefore, the critical mass must be created at the moment of explosion.

The Smyth Report suggests that this can be accomplished by breaking down the charge into two or more well-separated parts, each having less than the critical mass. At the appointed moment these could be brought together within the bomb to create a supercritical mass, which would then explode automatically.

CLAIMS LIKE THESE ARE NOT JUSTIFIED

1. Pretty soon no more coal will be mined except as a raw material for chemical manufacture.

2. In a few years a tiny bit of uranium, built in at the factory, will drive your car for life through an engine no bigger than your fist.

3. All the big central stations will soon be running on atomic power.

4. Cheap atomic energy will enormously reduce the price of power.

Peacetime Applications

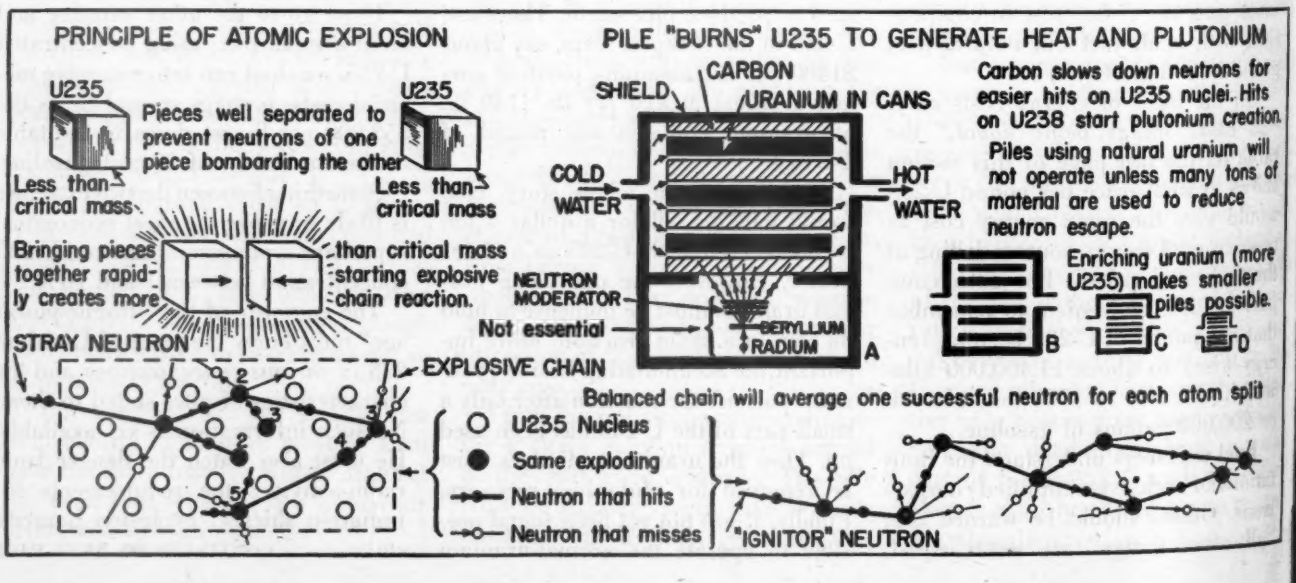
Except possibly for superblasting operations, uncontrolled explosive reactions cannot be permitted in the peacetime use of atomic energy. This means that the quantity of U-235 assembled in any one spot must always be kept well below the critical weight to avoid spontaneous explosion.

Depending on the particular application, the most desirable concentration of U-235 may range anywhere from the 0.7% in normal uranium up to 100%, with the probability that many industrial applications will find the greatest economy in concentrations between 1% and 15%.

This matter of the degree of concentration of U-235 has received little public attention, yet nothing could be of greater practical importance. To make this point clear, consider the two extremes, 0.7% of U-235 and 100% of U-235, respectively.

The Hanford pile, using normal uranium (0.7% U-235) with carbon moderator, must be very large to work at all. It is inefficient in the sense that it must be shut down after a small part of the U-235 has been consumed. It cannot operate at high temperatures.

Its great advantage as a heat producer is the fact that its U-235 is bought at the lowest possible price. If



FROM ATOMIC ENERGY

...BUT REMEMBER THESE FACTS

1. The large-scale, controlled release of heat energy from U-235 has been fully demonstrated.

2. Beyond question, this energy could be applied directly for heating water and air, and making steam.

3. Such heat, in turn, could be applied directly, or converted into mechanical power or electricity by conventional steam turbines and gas turbines.

4. If and when U-235 in concentrations up to 10% costs less than $25,000 per lb., it may find applications, but will compete, at first, with premium fuels rather than coal.

purified normal uranium sells for, say, $10.00 per lb., the price of 140 lb. (containing one lb. of U-235) will be only $1400. This would be a very favorable price if the pile could operate efficiently with the 0.7% U-235.

Concentrating the U-235 to 100% would permit a much more compact and convenient pile — perhaps little more than small pieces of U-235, encased in aluminum to ward off corrosion, and immersed in a tank of water; this should convert the water into steam at a regulated rate.

In large part, the control would be inherent. The water as a moderator would keep the chain going, but if the reaction got too violent, the resulting higher superheating of the steam would decrease the moderator effect and thereby hold the reaction in check. Yet even if all this comes true the cost of concentrated U-235 in the near future will be many times $10,000 per lb.

Running up the concentration only a few percent above that in normal uranium may prove to be the way to get reasonable pile size and good efficiency without incurring exorbitant concentration costs.

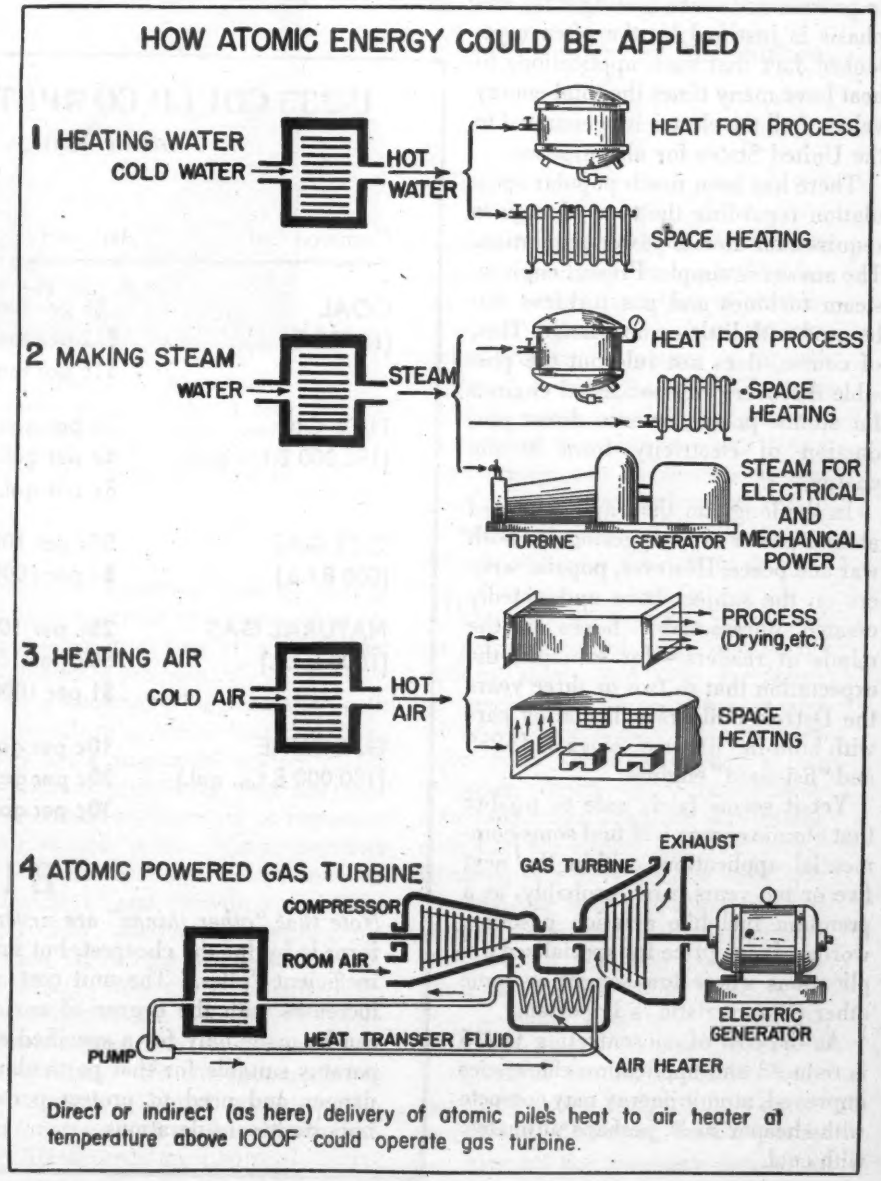
When atomic energy is applied, the starting point is heat, picked up by water, air or a special heat-transfer fluid. Intermediate heat transfer fluids may be essential in certain applications (space heating and service water, for example) where people must be protected from injury by radioactivity.

The intermediate heat-transfer fluid shown for the gas turbine would, of course, have to operate at temperatures up to 1200 F. There seems to be no basic reason why the pile itself could not be built inside the compressed-air receiver, discharging its heat directly to the compressed air.

With rather high concentration of U-235, this arrangement might be suitable for large airplane drive if excessive weight of radiation shields could be avoided.

Also, presumably, rockets and planes of the "buzzbomb" type could be powered by atomic heat delivered to the air of the jet steadily, not in puffs.

The sketches stress direct applica-



Direct or indirect (as here) delivery of atomic pile's heat to air heater at temperature above 1000F could operate gas turbine.

THESE THINGS MIGHT RESTRICT USE OF ATOMIC ENERGY

1. Ineffectiveness of large piles using normal U-235 concentration
2. High cost of concentrated U-235 for smaller, more effective piles
3. Danger from radioactivity
4. Weight and cost of shielding against radiation
5. Explosion hazard
6. Possible short supply of uranium
7. Governmental restrictions on atomic-energy materials

tions of hot air, steam and hot water to process and space heating. This emphasis is justified by the often overlooked fact that such applications of heat have many times the total energy value of all the electricity generated in the United States for all purposes.

There has been much popular speculation regarding the type of engines required for atomic-power generation. The answer is simple. Present engines, steam turbines and gas turbines can be used with little or no change. This, of course, does not rule out the possible discovery of specialized engines for atomic power, or even direct production of electricity from atomic energy.

In the long run the implications of atomic power are staggering for both war and peace. However, popular writers on the subject have undoubtedly created unreasonable hopes in the minds of readers — for example, the expectation that in two or three years the Detroit builders will market cars with built-in "lifetime" slugs of U-235 and "fist-sized" engines.

Yet it seems fairly safe to predict that atomic energy will find some commercial applications within the next five or ten years, first, probably, as a premium fuel like aviation gasoline, worth a fancy price for specialized applications where low weight or some other characteristic is important.

As the cost of concentrating U-235 is reduced and application efficiencies improved, atomic energy may compete with cheaper fuels, perhaps ultimately with coal.

Important non-power applications of atomic energy may well include the ultra-high-temperature processing and fabricating of materials — also, modern "alchemy": building and rebuilding atoms to create new elements and to produce old elements at lower costs.

Radioactivity obtained directly or indirectly from artificial atom-splitting should find many important medical and industrial applications.

Turning back to ordinary power applications, we must avoid the temptation to overstress the economic importance of lower-cost power fuel. Fuel cost is only about 17% of the gross receipts of the electric utilities. Here's another way to put it: If, after allowing for transmission losses, one kilowatt-hour delivered to the consumer from modern plants represents a coal consumption of 1.5 lb., and if the coal costs $5.00 per ton cancellation of the coal bill could not save more than ⅜ of a cent per killowatt-hour. And atomic fuel will certainly not be free.

Performance of the atomic bomb is a monument to the scientists who unlocked the secrets of the atom and suggested the basic technique of making plutonium and concentrating U-235.

From there on, the job was at least 50% engineering. The various big plants of the Manhattan Project are vast assemblages of pipes, tanks, boilers, valves, instruments and controls, installed and operated by engineers, largely designed by engineers. From now on, the speed with which atomic power becomes practical will depend on the effectiveness of the engineer-scientist team.

It is possible, of course, that national controls may completely upset the entire technical and economic pattern of this discussion. For reasons of national security the government may decide to control or restrict atomic-power materials, plants and operations in ways not yet determined.

U-235 COULD COMPETE AT THESE PRICES

other things being equal

Common fuel	*Assumed prices*	*Comparable prices for Uranium 235, dollars per pound (nearest thousand)*
COAL (13,000 B.t.u.)	$6 per ton	$9,000
	$12 per ton	$18,000
	$15 per ton	$23,000
FUEL OIL (150,000 B.t.u. gal.)	2¢ per gal.	$5,000
	4¢ per gal.	$10,000
	8¢ per gal.	$20,000
CITY GAS (500 B.t.u.)	50¢ per 1000 cu. ft.	$39,000
	$1 per 1000 cu. ft.	$78,000
NATURAL GAS (1000 B.t.u.)	25¢ per 1000 cu. ft.	$10,000
	50¢ per 1000 cu. ft.	$20,000
	$1 per 1000 cu. ft.	$40,000
GASOLINE (150,000 B.t.u. gal.)	10¢ per gal.	$26,000
	20¢ per gal.	$52,000
	30¢ per gal.	$78,000

BUT

Note that "other things" are never equal. U-235 in normal uranium form is by far the cheapest, but involves use of excessively large and inefficient "piles." The unit cost of the U-235 in enriched mixtures increases with the degree of enrichment. Over-all cost comparisons can be made only for a specified concentration of U-235 and for apparatus suitable for that particular concentration. Possible explosion danger and need to protect personnel against radiation are other important considerations.

Controlled ELECTRICAL MAINTENANCE

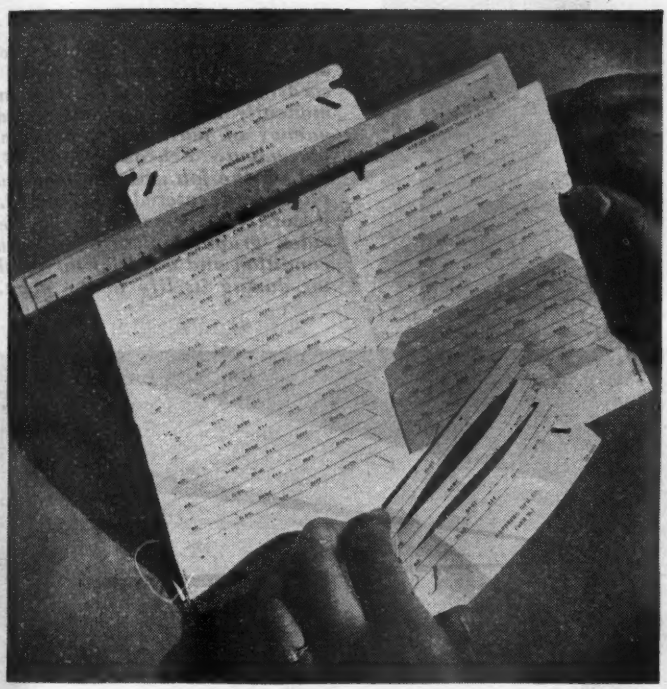


FIG. 1—Interlocked tabs form the master index file (Kardex Chaindex) of all motors in the entire plant. Colored tabs designate different types of equipment. One or more cards are used for each building. Tabs of motors moved to another area are simply removed and placed in proper card holder.

New record system marks the first step of a controlled electrical maintenance program at the Nordberg Manufacturing Company in Milwaukee.

EVERY plant electrical supervisor would undoubtedly give his eye teeth to be able to anticipate an electrical failure and make the necessary repairs or replacements on "off hours" to prevent costly production shutdowns. Were he able to do this, not only would he save the production department and management considerable grief but he would have the facilities for setting up a practically infallible preventive maintenance program.

This is precisely what Carl Lau, chief electrician of the Nordberg Manufacturing Company, Milwaukee, Wis., —one of the largest producers of diesel equipment and other heavy machinery —is attempting to accomplish. While others may consider such an attempt a bit of "wishful hoping," he, with the cooperation of the plant management, has installed a new, simple and comprehensive system of keeping records of plant electrical maintenance and repairs—the first step of a controlled maintenance program.

In a manufacturing enterprise such as Nordberg's, where heavy machine tools are a substantial portion of the production equipment, electrical control contacts and parts are an important maintenance item. Many machines have more than one motor; some as many as 13 and 16 with complicated electrically interlocked sequence operation. How long will electrical contacts last? How many machine hours of production can be expected before electrical repairs or replacements will be necessary? No one apparently has the answer. Control manufacturers can throw no light on the subject. Contact life depends upon so many variables—type of machine; type of work machined; duty cycle of the motors; atmospheric conditions around the motor and control; and type of machine operator (whether he runs the machine properly or abuses it through improper operation). So Mr. Lau decided to gather his own data for each of the 5,000 motors in the plant. It is a huge project and its ultimate success rests primarily on the type of record system used. From an analysis of these records will come the data he is seeking.

Previously all electrical repair and maintenance records were kept on individual sheets filed away for future reference. The three-by-five master motor file cards had no space for such information. Shuffling through sheafs of paper records was a cumbersome chore and frequently there was insufficient data for critical analytical study. Knowing that there must be some system available that would give him the necessary information in an easy-to-study, readily accessible form, he investigated the adaptability of his Kardex perpetual inventory file to the maintenance field. He consulted representatives of Remington Rand, Inc., and together they designed the compact card forms illustrated herein—cards that give all the necessary data at a glance and lend themselves to quick



FIG. 2—Typical set of cards in their insert holder (removed from the file). Office copy of the maintenance record is under the schedule copy. Note colored signal which can be moved along the office copy date-line tab to designate next maintenance date. Test record graphically portrays condition of insulation.

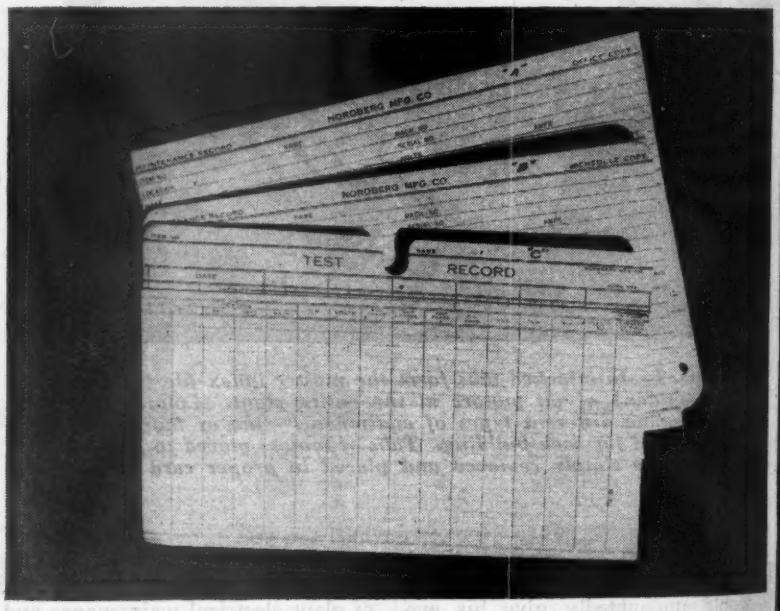


FIG. 3—Complete maintenance records are provided by these three cards. Office Copy (A) remains permanently in the file and records frequency of parts maintenance and replacement. Schedule Copy (B) goes out on the job with the man and supplies data entered on Card A. Test Record (C) remains in the file; provides graphic picture of insulation condition and a full history of the motor during its life in the plant.

analytical study. Apparently, this is one of the first applications of the Kardex system to an electrical maintenance department.

The Kardex Maintenance Records

The new file, installed last October, consists of four cabinets, each containing 15 removable card racks. Each rack accommodates 68 complete sets of records. The complete file occupies a space 47 in. by 27 in. by 22½ in. and rests on a metal table equipped with casters. Additional files can be added as required. Data can be recorded on the cards while in the file, or the racks can be removed and placed on a desk.

A separate master index file lists each motor in the entire plant. Identification data (motor name; item number; machine name; building, bay, department location) are typed on heavy paper tabs which are linked together and inserted in a card holder to form the Kardex Chaindex file (See Fig. 1). One or more cards (each card holds 20 tabs) are used for each building, presenting a complete list of all motors in that area. Added to compactness is the flexibility of this system. Should a motor be moved to another building or plant, the interlocked index tab for that specific motor is merely removed and placed on the card for the new location.

To provide quick identification of equipment types, the index tabs are colored according to the following code:

Blue—D.P.C. owned equipment (all types)

Salmon—Navy owned equipment (all types)

Buff—Nordberg direct current equipment

Pink—Nordberg alternating current equipment

Green—Nordberg variable speed equipment

White—Nordberg portable equipment

Crane motors are kept in a separate Chaindex file according to building locations. Maintenance and repair records of these units are also kept separate from the other equipment.

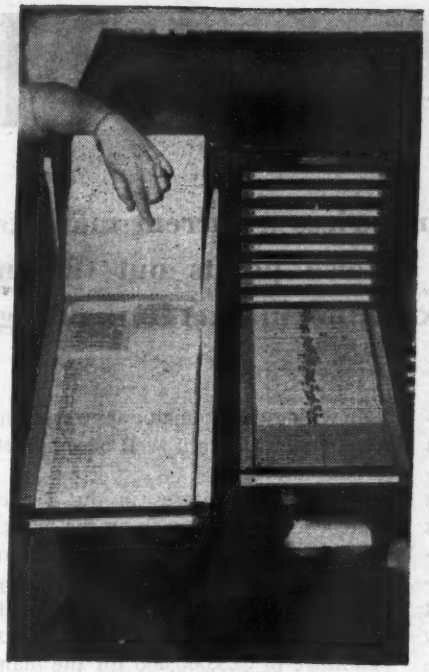
Electrical maintenance and repair data for each motor are recorded on a set of three cards (see Fig. 3, A, B, and C). These are mounted to an insert card which fits in the rack of the file. Fig. 2 illustrates a complete set of maintenance records removed from the rack.

The Office Copy—Card "A"—has space for recording the essential motor nameplate data; control equipment data; cost and purchasing data. The lower half of the card is the service record of the motor and control. Notations of the maintenance, repair or replacement of those parts listed are made in the space designed for that purpose. The bottom of the card is a folded date-line tab along which a blue plastic "signal" can be moved to indicate the next date for which maintenance is scheduled. Motor identification data is repeated here as this is the visible edge of the card when it

lies flat in the rack. This card remains permanently in the file.

The Schedule Copy—Card "B"—made of heavier stock is practically the same as the office copy. The one difference is in the arrangement of the space for service record. Here the card is designed to indicate the badge number of the man to whom the job is assigned, the date, number of hours, the type of work done, and the parts replaced. The entire back of the card is also ruled for recording such data. This card goes with the maintenance man to the job, is filled out by him and returned to the office each evening. Parts replacement and repair information is transferred from this card to the office copy. The schedule card is then inserted in the office copy holder and the "signal" moved over to the next maintenance inspection date. If a motor gives an unusual amount of trouble and requires numerous maintenance calls, there may be several schedule copies in a single file. This is a sign which bears immediate investigation to determine if the trouble is electrical, mechanical, or human error (improper operation of the machine or inadvertent abuse).

The Test Record—Card "C"—is a double card. The upper half is ruled so that insulation resistance readings, from zero to infinity, can be recorded in graph form as successive tests are made. The obvious fact that an irregular line is a better indicator of insulation condition to the eye than a series of figures jotted on paper shows the importance of this specific card in the maintenance file and the wisdom of the choice. The lower or second part of the double card, both front and back, is



Flat overlapping cards with visible edges provide finger-tip access to maintenance records. Each tray has 68 card insert holders.

a history record of the motor during its life in the plant. Here is space for recording data, location (bldg., bay, dept., machine), hp., volts, phase amperes (1,2,3), d-c amperes, kva., kw., power factor, feeder number, breaker or fuse rating. This card can also be used to record data on feeders throughout the plant.

These are the component parts of the new electrical maintenance record file. The card sets are inserted in the file trays according to building designation —one or more trays per building depending upon the number of motors involved. All the repair and maintenance data recorded originates with a breakdown call. Every additional call thereafter is added to the record. By using this as a starting point, Mr. Lau hopes to get some idea as to the expected trouble-free life of the equipment and its parts—in hours of machine operation. By analyzing the record he will be able to say that a contact tip, field coil, commutator, brush or bearing—under the known operating conditions—will last just so long. A replacement (not check-up) schedule can then be worked out whereby those parts will be replaced before they are worn to the breakdown point.

Objectives of the System

Considerable thought and planning went into the organization of this record system. It wasn't purchased just on a whim or hunch. Definite objectives were constantly kept in mind. With this system, Nordberg's electrical maintenance department hopes to:

1. Establish a complete finger-tip record of each motor and its control equipment together with all repair and replacement data.
2. Maintain a running check on each piece of electrical equipment in the plant.
3. Determine, through study of the repair and replacement records, the probable operating life of motor and control parts under the operating conditions to which they are subjected.
4. Set up a definite preventive maintenance *replacement* schedule for motor and control parts, based on life expectancies determined from the

[Continued on page 111]



File trays can be removed and placed on desk if desired. When cabinets are shifted from above arrangement trays can be placed on the desk-height sliding shelf on Kardex file and entries made at the cabinet.



Over 4,000 sets of maintenance records can be accommodated by these four file cabinets. Data can be entered while they are in the flat trays of the file.

THEATRE

This article summarizes a current market survey conducted by *Boxoffice*. It also points out the importance of the Theatre as an exhibition market for new Lighting Techniques.

THE motion picture theatre industry, now comprising more than 19,000 plants for the public exhibition of motion pictures to more than 12,000,000 patrons daily throughout the United States and Canada, is actually a legitimate offspring of the electrical and lighting industries. But it still suffers, perhaps due to its early precocities and past and present peculiarities, the undeserved status of a neglected orphan as compared to other industries possessed of only a fraction of its potential power for educating the public on the use of values and advantages of applied lighting and electrical energy.

Perhaps the situation stems from the attitude of the revered father of the Mazda lamp (and incidentally the sire of the motion picture projector) who, upon the advent of talking pictures in 1928, told reporters for the press he didn't think much of the future of talking pictures.

"The talking movie is a novelty now, but I am afraid the craze will not last", he said.

How wrong were the estimates and predictions of Father Edison is indicated by subsequent events and developments. What he referred to as a craze has since become one of the greatest and most forceful utilities for the molding of public opinion—a business of vast and varied development possibilities with which manufacturers and merchandisers might well become better acquainted.

Our 17,990 theatres in the United States do a gross cash-on-the-barrelhead business of nearly two billion dollars a year and represent a property investment of $1,900,000,000 with a normal (prewar) average annual expenditure of $25,000,000 for the maintenance and modernization of its plants, located in twelve thousand cities and towns throughout the country. The average seating capacity of our theatres is 621 persons per performance. Theatre operation ranks well among the ten most important industries of the nation.

But the importance of the modern theatre as a consumer of the new products of art, science and industry, and prominent user of the products of the lighting and lamps industries particularly, does not lie in its size nor the gross volume of its requirements. Its desirability from the standpoint of a cultivatable market lies in another direction, where it occupies a most unique position. *It is an introductory-exhibition market through which mass public interest in new product developments may be promptly, effectively and most economically aroused.*

Many manufacturers and developers of products useful in theatre construction and operation shy away from the theatre market, because, as they say, "the volume is not there." If they would but look beyond the one project at hand, and/or the 18,000 potential trade prospects, to the fact that (according to Department of Commerce figures in 1943) 95 million persons, (people from all walks of life, and thus inevitably including the much-sought "Average American") attend motion picture theatres weekly, their visions of volume might readily be realized.

No other type or class of industrial institution, catering to so many people, requires a greater diversity of lighting applications than the modern theatre. From the street-line to the rear exits, lighting for spectacular advertising display, decorative and directional effect, better vision, projection, stage and scenic effects and novelty presentation is extensively used and exploited in the very presence of the public. Color and animation are characteristic theatre lighting requirements.

A broad diversification of lighting problems is thus embraced in the construction or remodelling of a modern moving picture theatre. Probably no other type of building designed for pleasure-time public occupancy presents so many interesting structural and equipment problems, all of an exacting nature. And in the final analysis all must converge on one harmonious objective—House Appeal.

Since the theatre project, for reasons previously explained herein, is somewhat of a "gold fish bowl" to which public attention is constantly turning, and because people are inclined to judge the efficiency of product by results seen or otherwise experienced in the theatre, the supplier involved should be more than passively concerned with the manner in which his product has been put to use.

On this point, it is well to be reminded of the established fact that moving picture theatres rank second only to the press as a matrix for the formation of human moods and desires. The modern theatre building, if it

WHAT AMERICAN THEATRE OWNERS ARE PLANNING

	Jobs
New building on new site	171
Rebuild on present site	21
Remodel present building	172
Install new theatre front	207
General renovation and repairs	198
New air conditioning system	250
Reseating	269
Recarpeting	263
New lighting system	114
New projection and sound	155
Redecorating	227
Other property improvements	22

LIGHTING MARKET

By J. Harry Toler
Managing Editor
THE MODERN THEATRE section of BOXOFFICE

Each month for the past eight months, we have run a Lighting Techniques story. Each story has been related to a different lighting subject, and has presented the market, as well as the applicable lighting techniques, in one article.

This month we present Theatre Lighting Techniques, No. 9 in this series. We asked J. Harry Toler, Managing Editor of THE MODERN THEATRE section of BOXOFFICE, for the accompanying authoritative article which summarizes the theatre lighting market. Berlon Cooper's Lighting Technique story follows on the next page.

is indeed modern in all respects, therefore becomes a progress example in its community and as such a permanent little world's fair in its own right.

House Appeal, to which good lighting is a major contributing factor, plus the popularity of the moving picture creates a concentration of human interest that is always useful to industry at large. This unusually potent merchandising angle should be of vital interest to suppliers of lighting facilities, which are unusually susceptible to practical display and demonstration in theatres because of the dramatic and versatile role lighting plays in the operation of the theatre.

Digressing for the moment from the dramatic demonstrating effects of well-made movie installation on the buying habits of the public, let's now consider the extent of this pivotal market for lighting products now available in the wake of this war.

Current Market Survey

Since 1941, and the beginning of the war, few new theatres have been erected and all maintenance has been held to a very minimum because of material restrictions. During this interval, however, theatre attendance has been greater and profits from operation higher than ever before. A building boom, cut short by the war, will be resumed the moment civilian building restrictions are removed and materials become available again. It is conservatively estimated that three hundred million dollars will be spent for theatre construction during the first year after V-J Day.

Our publication is now in the midst of making an industry-wide survey to determine the extent and nature of theatre building and furnishing requirements applied to both all-new construction and remodeling of existent structures by present owners. Some 12,000 present theatre owners located from coast to coast were asked to tell us what they had in mind or had planned in the way of postwar building or remodeling activity. The return to date, incomplete at this writing, as shown in the accompanying panel will give some idea of lighting material requirements already planned for in the theatre field.

Pin-pointing this potential demand for the products of the lighting service industries, our incomplete survey shows that 21 houses will be completely rebuilt on present sites; 172 theatre buildings will be remodeled and modernized, and 207 of our present theatres will be fitted with modern front entrances, where modern lighting products and practices can be applied with unusual effect on public interest locally.

Fifteen theatre architects, members of the 35-man Advisory Staff of The Modern Theatre Planning Institute, our research subsidiary, queried about postwar theatre building prospects in their areas, recently reported a total of 167 all-new theatre building projects "just off their boards" and ready for postwar execution, or as soon as building permits are obtainable.

Lighting equipment manufacturers should join hands immediately with electrical contractors and suppliers to see that all or as many as possible of these new and remodeled theatre projects truly represent the maximum in lighting efficiency throughout. Whether or not they are involved in the misapplication of lighting to any of these theatres of tomorrow, the lighting industries will unquestionably suffer the consequence of poor and inappropriate lighting in these new places of public interest throughout the country, to whom the home-building citizenry will, as usual, look sharply for new ideas in lighting practice.

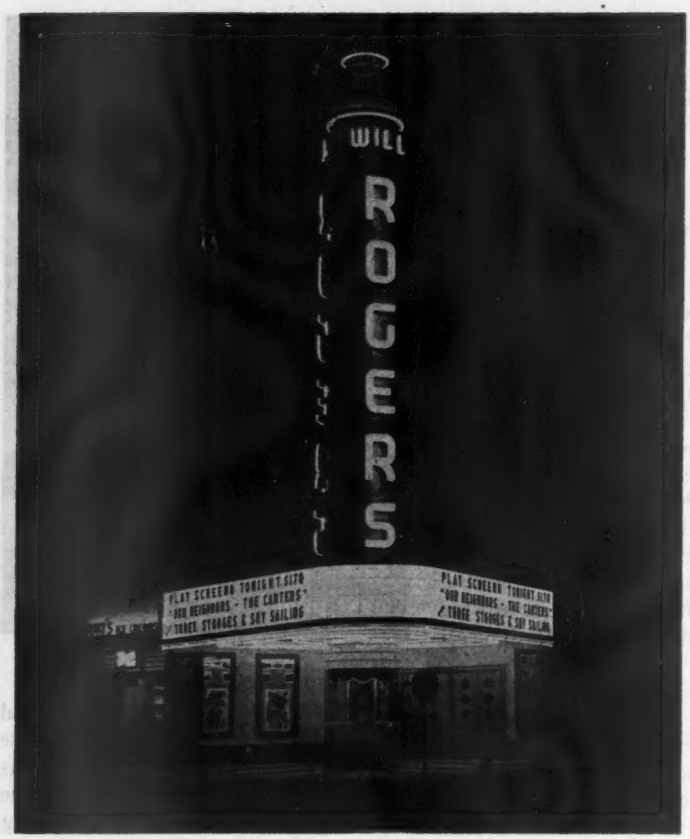
The new developments in lighting for display, decorative effect and seeing may be shown to distinct advantage or alternatively, they may be omitted or even inappropriately applied to our new and modernized theatres to the distaste of the public, and the detriment of the lighting industries. Such new principles as fluorescence, phosphoresence, ultra-violet (black light) lighting, and all other new forms of "advertising, seeing and painting with light" can use these strategically situated new theatres as demonstrators. But they must be done right; or they will be more damaging than beneficial to lighting.

Thus far we have discussed the motion picture theatre as a sole entity—a one-type amusement plant depending principally, and in most cases entirely, on the exhibition of motion pictures as the patronage inducement and by which it has not done badly in the past. But the one-purpose theatre building is being superseded by a new type of project which encompasses the provision of several other popular and most profitable amusement enterprises, all of which assume the characteristics of their chief contemporary attraction, the modern motion picture theatre, insofar as lighting requirements and other house appeal appointments are concerned.

This new type of amusement center building project has been visualized by leading architects in collaboration with city planners, and is now being sponsored by our publication. Under the new format, the motion picture theatre will no longer be an isolated element; but it will actually form the core of the community center plan. Known as the Multiple-Enterprise Amusement Project, that portion of the plant devoted to recreation will com-

[Continued on page 135]

THEATRE Lighting Techniques



Application of new light sources and equipment to theatre lighting problems are discussed in this ninth article of this lighting series.

By Berlon C. Cooper

THE modern theatre offers an outstanding opportunity to combine light with architecture. The theatre building, both inside and out, should embody dignified and pleasing architectural and decorative beauty. Enhanced by lighting, it will become a source of civic pride, and demand the respect and patronage of the entire community.

Lighting, properly understood and applied, forms the most versatile of all architectural and decorative elements. It can add life, sparkle, color, motion, beauty and interest, to an otherwise dull and drab monumental type building. In order to make full use of the full range of force and subtlety possible to achieve through the use of light, it is necessary to understand fully the many types of materials, light sources, and lighting equipments, available. It is also necessary to know the qualities and limitations of these components, all essential to effective and efficient lighting results.

Theatre proprietors are cognizant of the constant public demand for newness. Lighting, with its continual improvement and expansion through research, provides a medium for newness from which the theatre can meet this public desire. With approximately 18,000 theatres now operating in the United States, immediate and postwar modernization and new construction requires that designers, electrical engineers, and electrical contractors, be thoroughly familiar with both old and new theatre lighting techniques.

Artificial lighting requirements in the theatre are so many, and so varied, that use is made of practically the entire range of light sources, fixtures, devices and equipment. No attempt will



Indirect lighting from coves, soffits and wall niches are combined to provide illumination and decorative touch to this typical movie auditorium.

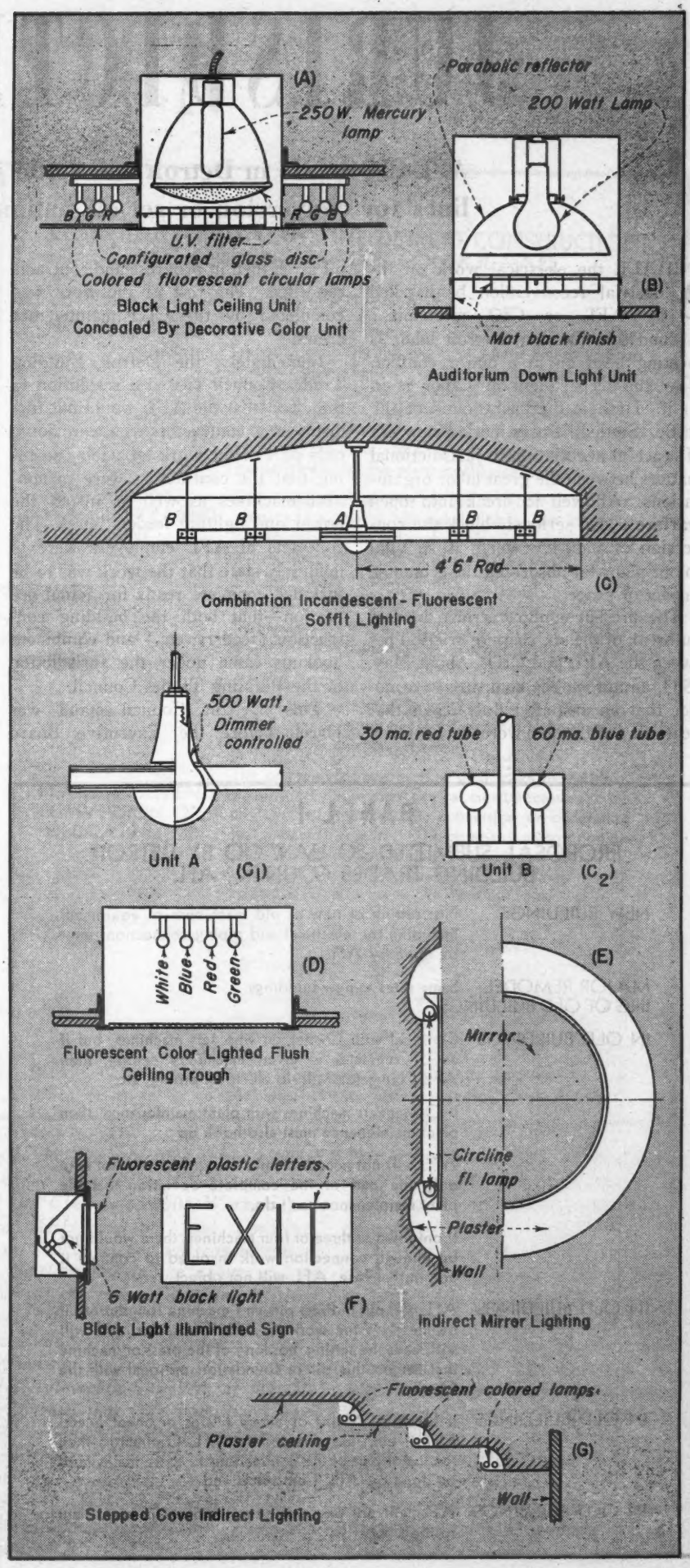
be made here to list all of these components of a lighting system. The wartime priorities system has not permitted civilian use of new developments in light sources, materials, and equipment during the war. Highlights of new developments, and application of both old and new lamps and equipment which can be applied to the lighting of theatres, are therefore outlined here.

Light sources. Incandescent light sources will continue to play the important role in theatre lighting. Concentrated filament lamps with their "point sources" are necessary for picture projection and for spotlights or other devices where accurate light control is desired. Standard filament lamps used for utility lighting and for decorative purposes, including the producing of color effects, are well adapted to smooth dimming from full brightness to blackout. Made in a wide range of wattages, sizes, shapes and colors, they offer maximum flexibility in fixture and equipment design, and in lighting result through adequate circuit switching and dimmer control.

Fluorescent lamps have not as yet been used widely in theatre lighting. The number of sizes, shapes, colors, and methods of control available previous to the war did not permit adaptation to theatre lighting techniques except in a limited manner. New sizes, shapes and colors, and new types of control equipment, have been developed during the war, or are now in process of development. These will open up new techniques and new possibilities for use. The new "slimline" and "circline" fluorescent lamps add new tools to the electrical contractor's kit, for utility lighting and new decorative styling. Cold cathode tubing, available in several diameters, readily curved to any shape, can be operated at varying current densities. Flexibility in color, intensity, size and shape of this tubing makes it particularly well adapted for use in combining light with architecture and decorations.

Coincident with the development of

[Continued on page 214]



Typical examples of modern theatre lighting devices. (A) radiates fluorescent carpets from ceiling. (B) furnishes white light without disturbing color effects. (C) combines incandescent and C. C. fluorescent. (D) shows 4 color lighting in continuous trough. (E) and (F) show typical uses of new lamps. Unusual color effects are possible with various combinations of light sources and coves (G).

JURISDICTION for

AFL-CIO battle in Detroit will settle jurisdictional lines for conversion or set off nation wide strife.

SHALL the electrical work on industrial reconversion be handled by AFL or CIO mechanics? Around this question, Detroit labor is meeting head on in a major conflict. Now the Department of Labor is in on it. Here is the background of the battle. Settled, it may mark a new era of peaceful negotiation in jurisdictional matters between the great labor organizations. Allowed to break into open warfare it can seriously block the conversion of industry which is so vital to our plans for absorbing the economic impact of peace.

The present conflict is just another outbreak of the six years of friction between the AFL and CIO. About May, 1944, an automobile company gave notice that on and after July 15 of that year all AFL men were to be taken off a job then in progress and contracts cancelled. The rest of the work was completed by the CIO maintenance crews.

Immediately, the Detroit Building Trades Council passed a resolution to the effect that the AFL would not furnish men to contractors who were doing only part of the work on a job (meaning that the contractors were to connect machines as well as install the power and lighting feeders, etc.). The contracts of AFL employers were to definitely state that the work was to be installed complete ready for actual operation—that both the building contruction (feeders, etc.) and equipment hookups came under the jurisdiction of the Building Trades Council.

This Detroit Council stand was placed before the Executive Board meeting of the Building Trades Division, AFL in Chicago (August, 1944). The meeting concurred in the action which was later approved at the AFL meeting in New Orleans in November of that year.

During the interim, a construction job came up at a major plant. Detroit contractors refused to bid the work and the Building Trades Council refused to furnish men to any contractor that would take the job without the equipment hookups. In effect, they told the manufacturer to go jump in the river and have his CIO maintenance men do the work.

The job went undone and the owner finally entered into an agreement that all work on the job would be AFL including the machinery connecting. Thereafter, the Building Trades took this stand on all reconversion work. When he later began to cut his maintenance crews, the CIO took notice. Fearing they would be put out of work, they retaliated immediately, went out on strike and picketed the plant, shutting down production. This gradually spread.

Early in 1945 a local Detroit contractor was awarded the contract to reconvert a building. All the overhead lines and high tension distribution lines were installed and then the CIO demanded to finish the job and a jurisdictional strike was called. The strike prevailed for some two weeks when the Army stepped in and demanded that the job be completed due to the fact that they had Army contracts in the plant. They awarded the job to the CIO under Army Command.

The result was a meeting called by Dan Tracy in Washington between the heads of the CIO and AFL. Result of the meeting: proposed that local AFL-CIO joint committee be set up to iron out the jurisdictional dispute. If no decision could be reached locally, the question was to revert to a National Committee composed of an equal number of CIO-UAW and AFL representatives and one neutral member acceptable to the labor members of the National Committee. Any decision rendered by this National Committee

PANEL I

PROPOSAL SUBMITTED TO UAW-CIO BY DETROIT BUILDING TRADES COUNCIL, AFL

NEW BUILDINGS	First setting of new or old machinery or equipment including the electrical and piping connections must be done by AFL
MAJOR REMODELING OF OLD BUILDINGS	Same rules as new buildings.
IN OLD BUILDINGS	Optional with Owner on who sets machines, but if AFL Contractor is given machinery setting, then AFL Contractors will do electrical piping, etc.
	If Owner sets machines with plant maintenance, then plant maintenance must also hook up
	AFL will not accept crumbs only, they will not take only the part of the complete operation that the plant maintenance can't do.
	If only two or three or four machines, there would not be enough connection work involved to contract it out, in that case, AFL will not object.
IN OLD BUILDINGS	AFL will put in Press pits and machine foundations if owner gives the work to AFL Contractor, and will still leave the setting, hooking of the press or machine that set on this pit or foundation optional with the Owner.
IN OLD BUILDINGS	If Electrical Mains or Steam Mains or Sheet Metal Mains, etc., are awarded to AFL Contractors then the major part of the connections to these mains must be done by AFL Contractors and
IN OLD BUILDINGS	AFL will not pay any permit money in any plant to the CIO

CONVERSION

By August Eckel

is to be binding on both Unions in accordance with the regulations set up at the Washington meeting. Here is the report of that action:

Meeting of joint committee representing CIO-Automobile Workers and AFL Building and Construction Trades Department, consisting of

Richard J. Gray, Vice-President, Building & Constr. Trades Dept.

Robert Byron, Vice-President, Building & Constr. Trades Dept.

Wm. E. Maloney, Vice-President, Building & Constr. Trades Dept.

C. H. Casebeer, 411 West Milwaukee, Detroit, Mich. CIO.

Melvin Bishop, Int'l Exec. Board Member—CIO-UAW.

Joseph Hofman, UAW-CIO

Clinton Golden.

D. W. Tracy.

The following action was taken by the Committee and is to be submitted to their respective organizations for consideration.

1. It is proposed that in each locality where there is in existence local organizations of the CIO-Automobile Workers and Building Construction Trades Department of the AFL, a joint committee will be set up for the purpose of peaceful and orderly adjustment of any problems or differences that may arise between the two respective organizations.

2. In the event that any problems or disputes arise on which the Local committee cannot reach an agreement, the question in dispute will be referred to a National Committee composed of an equal number of representatives of the CIO-Automobile Workers and the Building and Construction Trades Department of the AFL.

In addition thereto, there shall be another member of the National Committee who shall be a disinterested party and who will act as Chairman of the National Committee. The so-called neutral or disinterested party will be a man jointly agreeable to the labor members of the National Committee. The decision of this Committee will be final and binding on both organizations.

It is understood that the above proposal shall be submitted at the earliest possible time to the proper authorities of the CIO-Automobile Workers and the AFL Building and Construction Trades Dept., for consideration.

Supplemental to the above, and in view of the present situation existing in Detroit, we are recommending to the Building and Construction Trades Councils of the City of Detroit and the CIO-Automobile Workers of the city of Detroit, that they immediately appoint a temporary joint committee for the purpose of adjusting the present dispute and immediately return the members of their organizations to work without prejudice to their respective claims.

It is further recommended that the Local Committee in Detroit will return their men to work under the status that existed at the time the dispute arose.

It is agreed that the Committee would recommend that the CIO-Automobile Workers would notify the employers of the Automotive Industry that they would hold in abeyance their ultimatum, which provided that no AFL Building Tradesmen would be employed while CIO Maintenance Workers were being discharged pending conclusions of negotiations between the joint committees. Further, that the AFL Building and Construction Trades Department would

[Continued on page 213]

PANEL II

COUNTER-PROPOSAL TO THE DETROIT CONSTRUCTION AND BUILDING TRADES COUNCIL—AFL

BY CIO—UAW

NEW BUILDINGS	Where the mechanical working force is numerically capable of doing the work, or where the additional number of mechanical workers may be acquired, the mechanical crews shall perform any and all of the new building or buildings. Where the present or expanded mechanical force cannot perform the work required, the company shall retain such work as can be performed by the plant mechanical crews.
NEW BUILDING MACHINERY AND EQUIPMENT	The installation of new or old equipment and machinery in a new building shall not be considered as construction work and such work shall be performed by the mechanical crews of the company for whom the work is being performed.
NEW BUILDINGS	Where the work listed in paragraphs 1 and 2 cannot be handled by the expanding of the present mechanical crews, the company or corporation may contract out such work as they cannot perform, but at any time the company or corporation shall have the right to take back such work from contractor as is necessary to maintain continuity of employment for their regular or expanded mechanical crews.
OLD BUILDING REARRANGEMENT, CONVERSION OR DECORATING	The company or corporation shall make every effort possible to employ mechanical crews necessary to do any and all arrangement, conversion or decorating that they may require. The company or corporation shall recognize the preferential hiring rights of all UAW-CIO members capable of performing the required work or parts of the required work.
MAINTENANCE WORK	The maintenance work of the company or corporation shall at all times be performed in its entirety by the mechanical crews of the company or corporation.
	In consideration for the above, the UAW-CIO will recommend to the company or corporation that in contracting work AFL contractors be given consideration. Further, the UAW-CIO stands ready to implement any practical machinery to take care of any problems not provided for in the above paragraph.

CAT-CRACKER WIRING

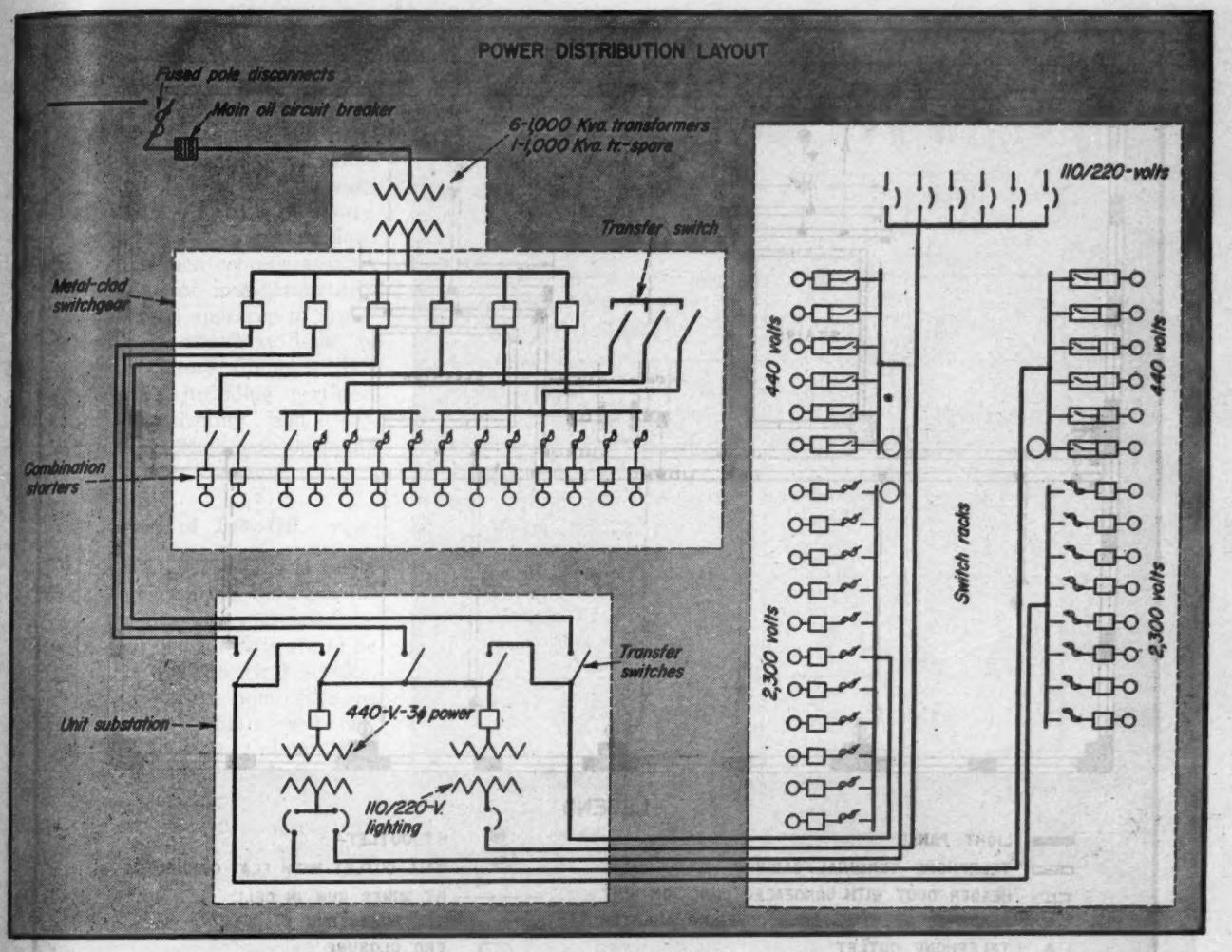
Pacific Electric Motor Co., Oakland, Calif., completes intricate electrical installation on the world's largest catalytic-cracker unit for the Tide Water Associated Oil Company at Avon, Calif.

By H. W. Young

WITHIN recent weeks, the electrical installation for the largest fluid catalytic-cracking plant in the world, at the Avon, California, refinery of the Tide Water Associated Oil Company, was completed by the Pacific Electric Motor Co., of Oakland. This modern, 100 octane gasoline unit is capable of post-war production of large quantities of excellent quality motor gasoline. For the duration of the war, however, its entire output has been diverted to the production of military aviation gasoline. The cost of the unit, including auxiliaries, exceeded $10,000,000.

The "cat-cracker" converts gas oil into high quality products by contin-





ually contacting this oil with large quantities of a finely powdered catalyst. The contacting is done in a 300,000 gallon reactor vessel. The catalyst, comprising either a selected natural clay or synthetic material, is "spent" by contact with the oil. This spent catalyst is then continuously revived in a large, brick-lined regenerator which is located on top of the twenty-story structure. The regenerated catalyst is then circulated back into the reactor for reuse. In order to prevent the loss of valuable catalyst, a system of multiclone dust-recovery equipment and Cottrell high-voltage dust precipitators are used. Products from the reactor are sorted into useful components in the multi-tower gas recovery and stabilization unit.

The construction of the unit was handled by C. F. Braun & Co. of Alhambra, California. The process is licensed by the Universal Oil Products Co., of Chicago, who also assisted both the C. F. Braun & Co. and the Tide Water Associated Oil Company engineers in designing the unit.

Because of the importance of the electrical system to the proper operation of the cracking process, the selection of the Pacific Electric Motor Co. to handle the electrical installation was a tribute to that company's outstanding qualifications in electrical engineering and contracting.

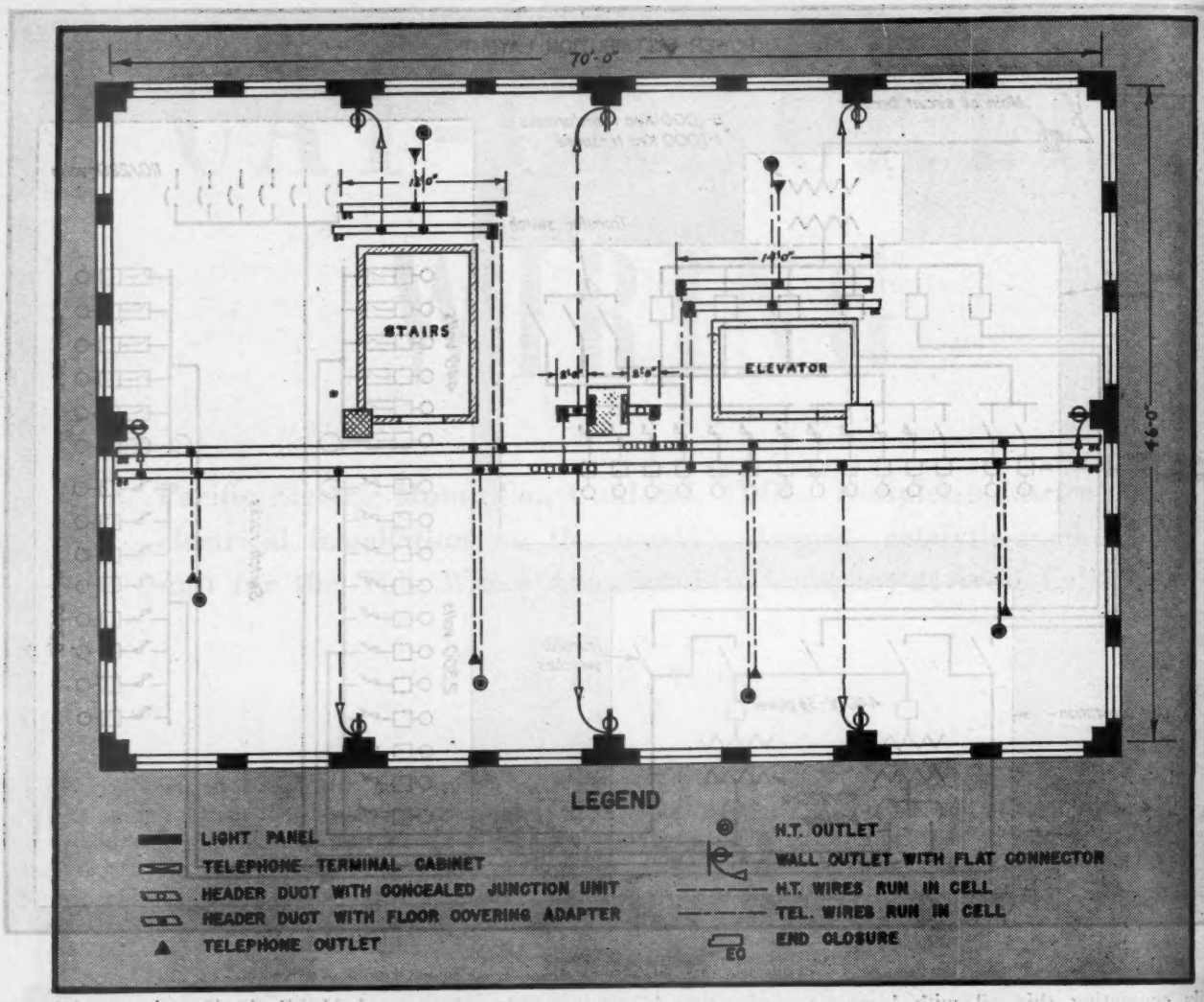
To complete a project of this size in the time specified, it was necessary for Pacific Electric Motor Co. to set up a complete, self-sufficient production organization on the job site. This consisted of a field office, drafting room, superintendent's office, tool room, change room, machine shop, and two stock rooms. The field staff consisted of a general superintendent, four general foremen, two stock clerks, one truck driver, one timekeeper, and one general office clerk, plus an average crew of 65 electricians.

The Pacific Electric Motor Co. was authorized by the owner to specify and furnish all of the major items of electrical equipment and installation materials, and in some cases it was necessary for the manufacturers to make changes in their equipment to meet the requirements of the Pacific Electric Motor Co. engineers.

All underground wiring was V.C.L. and V.C.R. in Transite conduit, all lead-covered cables 2300 volts and over being terminated in potheads. All conduit fittings used were of the explosion-proof type, special tests being made on all sealing fittings to safeguard against escaping vapors.

Three feeders were installed to serve the cat-cracker, oil-immersed transfer switches being installed to provide means for paralleling or transferring feeders, as noted on the diagram. A special alarm system was also installed to safeguard against power failures, while sound powered telephones were installed between control room and each landing of the unit.

Because of wartime shortages and long delivery schedules, careful planning and close coordination between the purchasing department, the engineering department, and the production department in the field was essential. However, because of this coordination and the ability and long experience of Pacific Electric Motor Co. personnel, all schedules were adhered to, and the equipment furnished met with the owner's rigid requirements to his complete satisfaction.



How to ESTIMATE CELLULAR FLOOR WIRING

Accurate estimating data from recent job experience on cellular steel floor wiring jobs.

By L. F. Kummel
Supervisor Underfloor Distribution
General Electric Company

ESTIMATING the installation of cellular floor wiring is no different from estimating the installation of any other electrical material. The estimator must know the products and how they are used. He must apply the same basic methods of job analysis as he would use for other types of work.

The two major divisions of the work are conventional. First, the materials take-off from the plans, then pricing of materials and labor. Needless to say that the accuracy of the estimate depends upon the thoroughness of the contractor or estimator in take-off and picking up the materials called for in the specification.

In this article the mechanics of the actual take-off will be shown step by step, and also the estimated man-hour units of labor. These man-hour units have been arrived at from actual labor costs on several jobs in different parts of the country. Bear in mind that these units are averages.

In making the take-off, it is necessary to know the number of electrical

services involved. This information can be obtained from either the specs, plans, or both. The number of services, such as light and power, telephone, signal, etc., indicates the type of *header* to be used. If two services are required, *duct* with *junction units* spaced on 12-inch centers is necessary. If three services . . . *junction units* would be on 18-inch centers, etc. A thorough outline of installation procedure and method appeared in a preceding article in the May issue of *Electrical Contracting*. Complete data on the materials including pertinent information for selecting and designating individual items may be found in the manufacturer's catalog.

Procedure of Take-Off

MEASURE DUCT—This is easily calculated by measuring the runs indicated on the drawing illustrated.

If specs state that all *cells* are to be made available for electrical service, watch out for obstructions such as stairwells, elevator shafts, wet columns and wind bracing. Column lines break up the continuity of the cells and in such instances *jack headers* (short section of regular *headers*) will have to be used. It is the estimators problem to see that enough *header* is added to take care of such contingencies.

COUNT CLOSURES—After the *duct* is measured, count the *end closures*. Remember that if *jack headers* are used, *end closures* must be included for each end. Only one *closure* is needed when *jack headers* are used for feeding to panel or cabinet.

CABINET EQUIPMENT—Next take off all the panel accessories. There are two methods of feeding, either *vertical ells* with straight *duct*; or *cell ells* with conduit. The estimator must know which method is being used.

Vertical Ell method: Here *header duct* runs at right angles to the face of cabinet.

Cell Ell method: Here *header duct* runs parallel to the face of the cabinet.

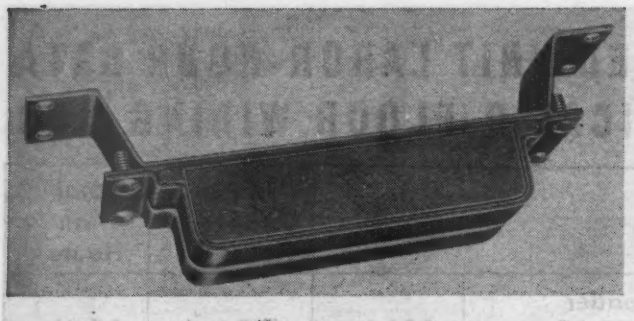
After determining which method is to be used, count the necessary fittings. For each *vertical ell* feed, there will be needed—one *vertical ell*, one *coupling*, necessary length of straight *duct*, and one *box connector*.

The *cell ell* feed consists of a *cell ell* plus the conduit nipple to the panel or cabinet.

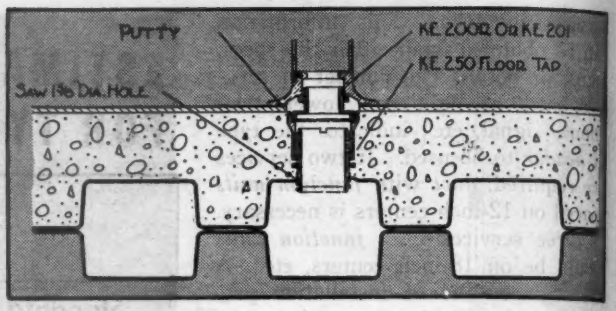
ACCESSORIES—Next count the accessory fittings such as conduit to *cell connectors*—*cell ells* used for out-

ESTIMATED UNIT LABOR-HOUR DATA FOR TYPICAL Q-FLOOR WIRING JOB

		Unit Man Hours	Total Man Hours
Standard Header SPK 1000-12	196 ft.	.077 ft.	15.09
End Closure SPK 1100	14	.18 ea.	2.52
Feed Connections			
Vertical Elbow SPK 1102	2		
Straight Duct SPK 1103	6 ft.	.9 ea.	1.8
Coupling SPK 1104	2		
Box Connector SPK 1105	2		
Cell to Conduit Connector SPK 1850	8	.55 ea.	4.4
Floor Covering Adapter SPK 1501	32	.28 ea.	8.96
H.T. Outlet SPK 200R	6	.3	1.8
L.T. Outlet SPK 201	6	.3	1.8
Floor Tap SPK 250	12	.6	7.2
Cover Plates Furnished by Others	69		
Compound SPK 1111	5 gals.	.72	3.28
Self Tapping Screws SPK 1150	207		
Marker Screws SPK 1200	20	.28	5.6
Marker Screws SPK 1201	20	.28	5.6
Tool Kit SPK 425	1		
Unloading Truck	1912 lbs.	.055 cwt.	1.00



End Closure



Floor tap in place.

lets and *cell* to *junction boxes.* All these fittings are conduit fittings. These complete the roughing-in materials.

FLOOR COVERING ADAPTERS—These are usually designated on the plans as solid circles on the *header duct.* They must be counted. Where a *cell* is used for an outlet, a *floor covering adapter* must also be furnished. In addition to those shown on the plan, others might be called for in the specification. If so, they must be added to those counted.

OUTLETS—When outlets are shown on the plans they must be counted, bearing in mind that each type must be counted separately. Always check specifications for additional outlets. It is necessary to include a *floor tap* for each outlet.

SCREWS AND COMPOUNDS—*Self-tapping screws* and *compound* are needed to anchor the *cover plates* permanently. These are furnished by the electrical contractor.

The *cover plates* are furnished by the floor contractor. It is necessary to refer to the structural plans to find out the number for the job.

Three self-tapping screws are needed for each cover plate and one gallon of compound for every 20 cover plates. The screws and compound are added to the take-off material.

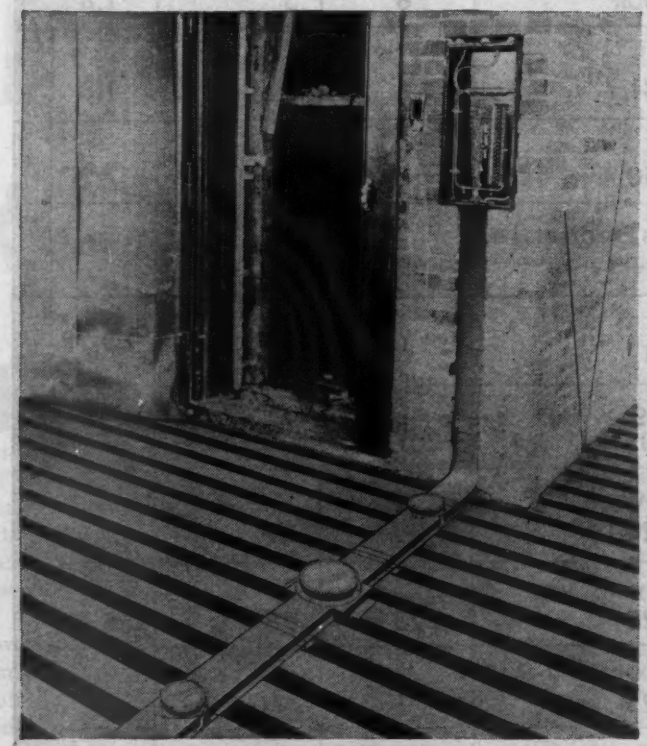
Where inverted type floors are used, *cover plates* are not needed. However, it then becomes necessary to furnish *jute tape* and a different type of *compound.*

Now the estimator is finished with the actual physical measurements and counting from the plans. Before transposing to the estimate sheet, he should check over the specifications and add all material called for in the specs.

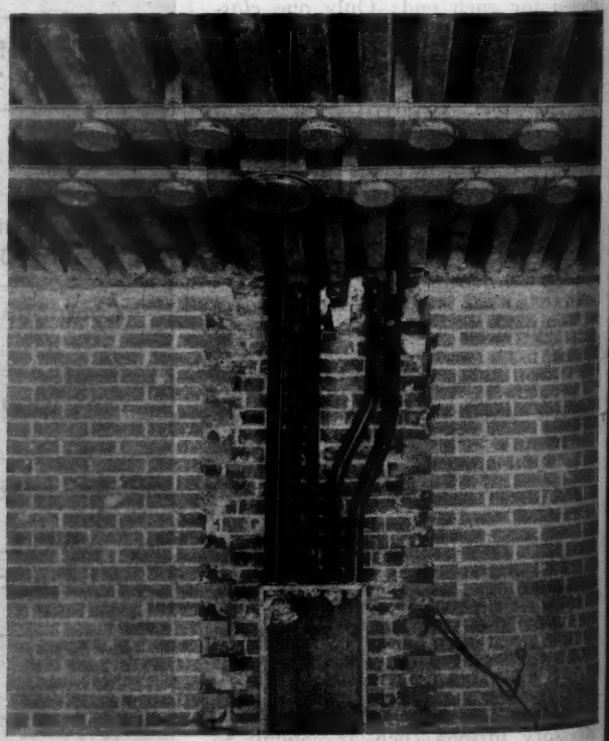
Probably the best way to illustrate the above instructions would be to use an actual example. The several types of fittings are indicated on the floor plan.

To recapitulate, the steps are as follows:

1. Measure Duct
2. Count End Closures
3. Take-off Panel Equipment
4. Count Accessories
5. Add up Floor Covering Adapters.
6. Count Outlets
7. Check specifications for additional materials.



Telephone strip cabinet showing connections with header duct.



Panel feed by use of conduit and cell ells to duct.

Labor Factors

Estimators know that labor rates per hour, and work output in different localities vary. Therefore, local conditions and experience must augment the units used in this article. Such special conditions usually apply to all parts of the job.

Handling Material—.055 CWT.

Handling of material is an important factor on any job. Therefore, work starts with the unloading of the truck. This unit is worked out on a pound basis instead of feet of *duct* because there are several different fittings involved to make up an installation.

Moving the material (carting) from the unloading point to the location of installation should be included with all materials used on the job. To set up units for this type of cost would be confusing because of the factor of distances carried.

Installation Of Duct—.077 FT.

The unit per foot of installing the *duct* covers the unpacking, laying out, erecting string lines, laying, cutting, assembling, and attaching to the floor with self-tapping screws. In other words, the unit includes all the labor necessary for roughing-in the *duct.*

Panel Equipment—.90 EA.

The installation of panel equipment consists of assembling the *vertical ell* to the *duct,* connecting straight *duct* to *vertical ell* and attaching to panel cabinet. This unit also includes the necessary cutting.

Accessories—.55 EA.

Conduit fittings such as *cell to conduit connectors* and *cell ells* are figured separately. The time shown for installation includes cutting a hole in the cell, attaching to the cell and nippling up to the outlet box. The time unit is the same for both types of fittings.

Floor Covering Adapters—.28 EA.

These fittings are installed only on the *junction units* which are in use. Job conditions dictate the method of installation. Adapters shown on the plans must be installed in the original work. In most cases the particular *junction units* are marked so that the floor covering contractor will not cover them when laying the floor covering. The cost of installing includes cutting a hole in *duct* and *cell,* the installations of *grommet* and attaching the *adapter.*

Outlets—.90 EA.

Outlets are usually installed after the floor has been completed. The work involved is cutting out a piece of floor covering, chipping out the fill over the *cell,* cutting hole in *cell,* installing *floor tap,* grouting in *floor tap,* and setting outlet body.

Cover Plates—.12 EA.

Cover plates are preformed plates that close the slots in the floors. The plates are furnished by the floor contractor. The electrical contractor after inspecting the *cells,* anchors them with three self-tapping screws. Before anchoring, however, the edges are brushed with a sealing compound. The labor unit includes the brushing, drilling, setting, and attaching.

As soon as Q-Floors are laid they become a working platform for all trades, thus speeding up operations.

Q-Floors facilitate the handling and storage of material. Stairs go up as soon as the floors are laid.

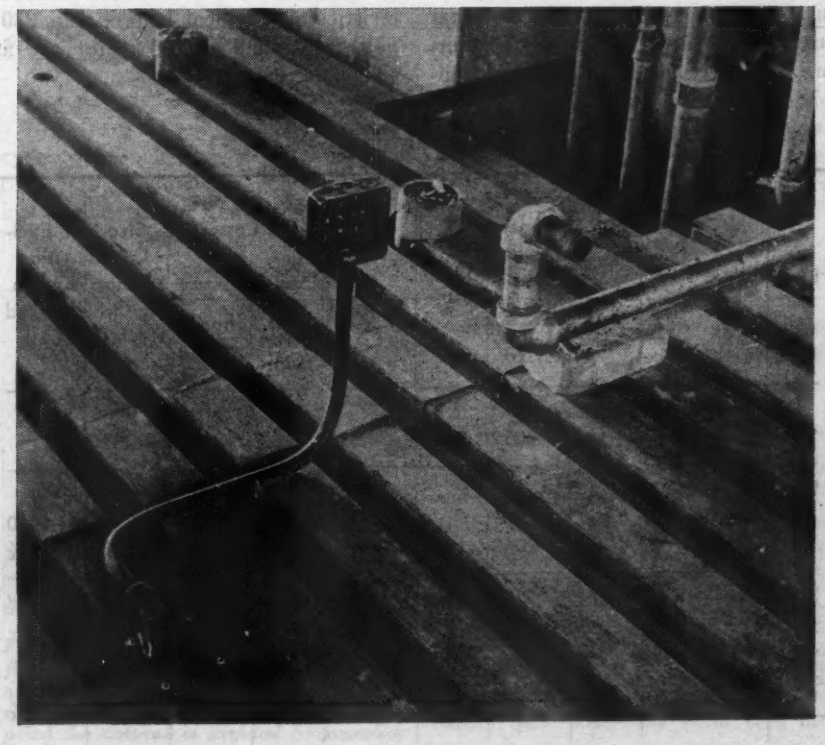
The recommended procedure will prove most helpful to the estimator in figuring any job with cellular floor construction.



Cover plates



Closing joints with tape and compound.



Conduit to cell connector feeding wall outlet in partition.

TESTING

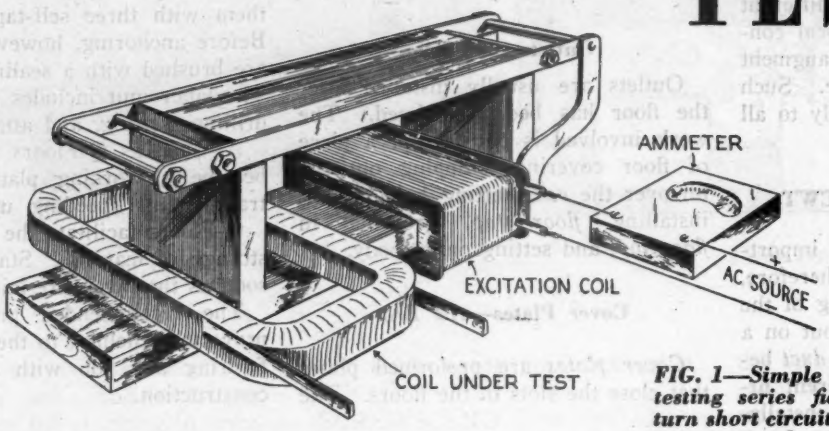


FIG. 1—Simple a-c growler as used in testing series field coils for turn-to-turn short circuits. Ammeter measures current in the exciting coil circuit—an increase in current indicating short circuited turns.

FIELD coils furnish the excitation for the electrical machine and obviously the coils will not perform this function satisfactorily if they have shorted turns or grounds. In reconditioning rotating electrical machinery all field coils should be tested. Defective field coils often cause loss of power, roughening of commutator, rapid wearing away of brushes, overheating of armatures and premature failure of the whole motor.

The excitation value in magnetic flux lines is dependent upon the ampere-turn strength. If some of the field coil turns are short circuited, there will be either a loss of ampere-turn strength or heavier than normal current may flow through the remaining effective turns to maintain approximately the normal magnetizing ampere-turn strength. Accordingly, *our measuring stick in testing the field coil is the ampere-turn strength available for excitation.*

The loss of a turn or a few turns does not always mean that a field coil must be replaced. A shunt field coil usually has a large number of turns of small round wire, and the current flowing through these turns is small when compared to the total machine current. Series field coils and commutating field coils have few turns as compared to shunt field coils and carry the full machine current.

Excitation values and coil characteristics of a typical 1-hp. 4 pole, 230-volt, compound wound motor are as shown in Table I.

TABLE I

Line	Field Winding	Resist. per Coil	Ampere Turns per pair of Poles	Active Turns	Current in Amperes	I^2R Losses		Size Conductor in Circular mils	% Excitation Loss in Shorted Coil
						Normal Coil	Shorted Coil		
1	Shunt	111	2072	2000	.518	29.8	.....	320	.....
2	Shunt (25 turns shorted out)	109.5	2063	1975	.52	30	29.6	320	4/10 of 1%
3	Series	.0062	720	9	40	10.32	.....	.....	.....
4	Series (one turn shorted out)	.0055	680	8	40	10.32	8.8	.....	11.0%

Now let us assume we have 25 turns shorted out in one of the four shunt field coils in the motor shown in Figure 1. Our characteristics will be as shown in Line 2, Table I, resulting in 4/10 of one percent loss in excitation of one coil and only ⅛ of one percent loss in the total shunt field.

Let us assume we lose the excitation of only one turn out of nine turns per coil of one of the series field coils because of a short circuit. The effect, shown in Line 4, Table I, is an 11 percent loss in excitation of one coil, or 2.8 percent for the entire field.

From these values we may conclude that a few turns loss in a shunt field coil is of little consequence but that we must have all series and interpole field coil turns active. Also note that coils with shorted turns and corresponding lowered resistance values have less I^2R losses but the remaining coils in series have higher than normal I^2R or heat losses. A defective field coil may then overheat and destroy the insulation of the other field coils connected in series with it.

Test Methods

Shunt field coils may be tested by one of several methods. The universal and most used is the voltage drop test. Several coils are connected in series and connected to a suitable d-c voltage supply. Then the voltage across each coil is measured and checked with the value found when the applied d-c voltage is divided by the number of coils in series. This voltage drop test is illustrated in Figure 3. Some variation is usually found and, as cited in the example given above, is permissible. Shunt coils are necessarily wound of

FIELD COILS

By D. E. Stafford
Design Engineer
National Electric Coil Co.
Columbus, Ohio

Field coil testing is a must on every repair job. Here are a few suggestions on why and how such coils should be checked.

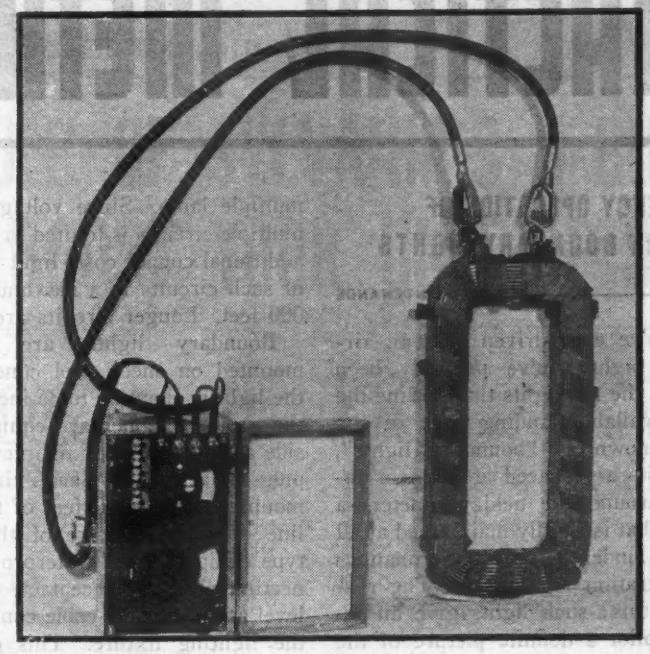


FIG. 2—Kelvin bridge is used to measure resistance of series field coils where resistance values are exceedingly small, ranging from 0.0001 ohm to 1 ohm per coil.

many turns of relatively small wire and some variations in voltage drop must be expected due to slight stretching of the wire, variations in insulated wire outside diameter (O.D.) and consequent variation in coil mean turn length. In the case of random wound coils, a few turns may be shorted together, lowering the voltage drop.

Another shunt field test of equal value to the voltage drop test is the resistance test. In this test the resistance of each coil is checked with a direct reading ohmmeter.

Shunt coil test equipment used in various coil manufacturing plants include coil turn counters, radio frequency turn testers and a-c balance testers. These are specialized test instruments and the economic justification of their purchase by the average user of coils is questionable.

Series and commutating field coils have low resistances and require the use of Kelvin Bridge type ohmmeters, similar to that shown in Figure 2, to accurately check their resistance values. When this type instrument is not available, an alternating current "growler" test can be applied to the interpole and series field coil. This test is very satisfactory and is applied in the manner shown in Figure 1. Short circuited turns are indicated by increased primary current in the "growler" exciting coil and by heating of the coil under test.

Never test shunt field coils on a "growler" of the type used for series field coil testing, as the induced voltages will puncture good turn and terminal insulation and the open circuit voltage at the shunt coil terminals may be from one to several thousand volts.

The usual "growler" as used for series field coils will have a core cross-section of from 8 to 10 square inches and a magnetic flux density of from 60 to 100 kilo-lines per sq. in. Our formula for induced transformer voltage is:

$$\text{Voltage} = \frac{\text{Frequency} \times \text{number of turns} \times \text{total flux}}{22.5 \times 10^6}$$

Accordingly, our induced voltage in a 3000-turn shunt field coil on a 60-cycle series field coil "growler" with a core cross-section of nine square inches and a flux density of 60 kilo-lines will be 3890 volts.

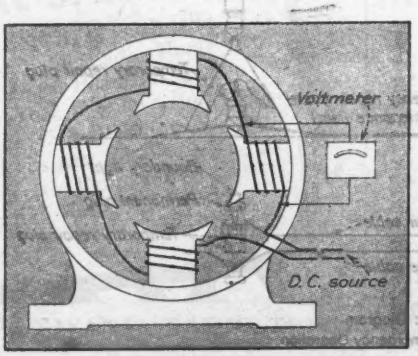


FIG. 3—Voltage drop test of shunt field coils on a 4-pole, d-c motor. Voltage across each coil is measured and checked with value found when applied d-c voltage is divided by number of coils in series.

The field coils of series wound motors may also be given a turn test without removing them from the motor frame by the use of a low variable voltage transformer. Low a-c voltage (10-100 volts) is applied across each coil and the a-c current noted. A coil with shorted turns will be marked by a large percentage current increase.

An a-c turn test must not be applied to the series and commutating field coils of a compound-wound motor while in the motor frame, as the induced voltages in the shunt coils may be of such magnitude as to destroy turn insulation in addition to being very dangerous.

Most compound-wound machines are accumulatively wound so that the series polarity is the same as the shunt field polarity.

The commutating poles of a *motor* should have the same polarity as the main pole following it, as referred to the direction of rotation. The commutating poles of a generator should have the same polarity as the main pole ahead of it in the direction of rotation. Another way of stating these rules is to say that *the commutating field coil polarity "leads" the main field in a motor and "lags" the main field in a generator.*

BRIEF ARTICLES about practical methods of installation and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

PRACTICAL METHODS

EMERGENCY OPERATION OF AIRPORT BOUNDARY LIGHTS

MAINTENANCE

If you've ever driven past an airport at night you've probably been aware of the red lights that outline the entire available landing area of the field. Known as "boundary lights", these units are spaced at 300-foot intervals around the field perimeter—a spacing that is rigidly maintained at all airports under Civilian Aeronautics Administration regulations. The reason for this: such lights give an incoming pilot a definite picture of the size and shape of the field (10 units on a side will indicate that the field is approximately 2,700 feet long). A pilot can often distinguish the blank space outlined by these units when flying over a heavily lighted district. Combined with the airport beacon, this is a double safety measure for locating and identifying the field.

Such units are usually fed by underground cables—either series or multiple circuits, depending upon the length of the circuit. Series circuits are 6.6 amp. with 320 lumen series lamps. Multiple circuits may be 2 wire, 120 volt; 3 wire, 115/230 volt, or higher voltage with individual transformers at each unit and a 15 watt multiple lamp. Since voltage drop of multiple circuits is limited to 5 percent, additional copper costs limit the length of such circuits to a maximum of 12,000 feet. Longer circuits are series.

Boundary lights are normally mounted on sheet steel cones so that the light is about 30 to 36 inches above the ground. Cones are equipped with side access doors for maintenance and plug replacements. Series circuit units mounted within 300 feet of the center line of a runway are of the tipover type equipped with waterproof disconnecting plug and receptacle at ground level and a flexible-cable connection to the lighting fixture. This eliminates rigid obstructions to planes that might overshoot the runway. The cones merely tip over when hit.

Undoubtedly you've also noticed that none of these boundary units are ever unlighted—a condition due to rigid electrical maintenance schedules and the use of emergency measures when necessary. One outstanding example of this is the emergency repair cable and temporary plugs developed to keep boundary lights in operation when an underground cable goes "out". The complete assembly for use on series circuits, as recommended by the C.A.A. in their drawing NAC-1012, consists of a length of cable sufficiently long to bridge two adjacent units (usually 300 feet) equipped with a temporary repair plug at each end.

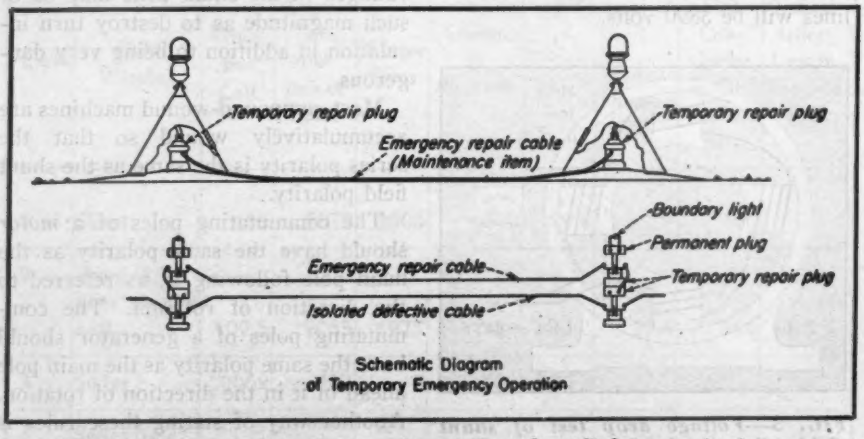


FIG. 1—Emergency service to airport boundary lighting units is provided by this repair plug and cable assembly. Temporary plugs are inserted between permanent receptacle and plug at base of lighting unit cone while cable bridges the two boundary lights. Schematic diagram illustrates method of isolating defective underground conductor.

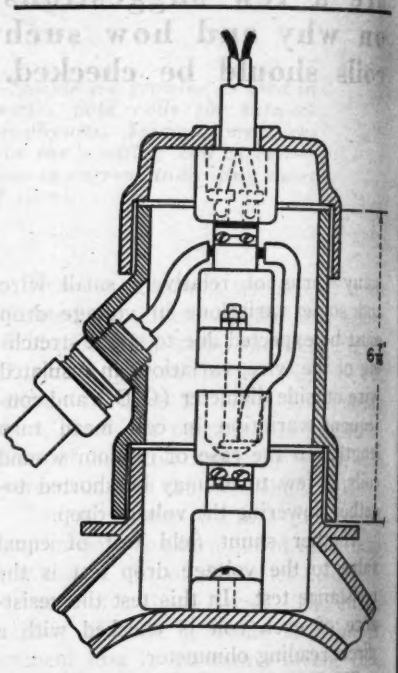


FIG. 2—Temporary repair plug is shown in detail. Unit with emergency cable connection (center section) fits snugly over receptacle at base of lighting cone. Permanent plug attached to light fixture fits over top of repair plug.

Application of this repair cable is illustrated in Fig. 1. Here two adjacent lighting units are temporarily connected to continue service while the defective underground cable is being repaired or replaced. The schematic diagram shows how the temporary repair plugs are inserted between the receptacle base of the boundary light and the plug which is permanently connected to the lighting fixture. By this assembly, the defective underground conductor is isolated and the circuit continuity maintained. Fig. 2 shows the details of the temporary plug construction.

Lighting is a vital factor in the safe operation of night aircraft service and every means available is employed to maintain continuity of electrical service.

(Advertisement)

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CONTRACTOR EDITION

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HANDY, SAFE TO BUY! No fuss! No fumble! You buy 5 Sylvania bulbs, safely packed in a compact container—each bulb in its own "Handy 5 Pack" pocket.

HANDY, SAFE TO CARRY! Tuck new "Handy 5 Pack" under your arm; drop it in your shopping basket. You use little space. There's no jumbling—

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HANDY, SAFE TO USE! No searching through a lot of loose bulbs. No danger of bulbs —g off shelf. —dy 5 Pack" —bulbs safe, —to use!

Ask him!

HANDY 5-PACK ADVERTISING GIVEN NATIONAL SPREAD

This advertisement, appearing in full color in the Saturday Evening Post, American Home, Ladies Home Journal, Good Housekeeping, House Beautiful, and —in black and white—in Newsweek, Nation's Business and Time, is telling over 15 million people about the advantages of Sylvania's new 5-bulb pack —the unit made to sell more electric light bulbs!

Estimated *readers* of these national publications total over 23 million!

MAKE— WORLD-FAMOUS SYLVANIA RADIO TUBES

Big-Scale Advertising Backs Handy-Pack Idea, Ups Bulb Turnover

The Handy 5-Bulb Pack, smash merchandising hit that sells *five* electric light bulbs in one convenient carton, is being backed to the limit by Sylvania Electric national advertising appearing in eight coast-to-coast publications.

Devised to speed your electric light bulb turnover, by boosting the unit of sale, the new Sylvania 5-bulb pack idea—through the kind of advertising shown here—is reaching over 15 million people—actual total circulation of these national periodicals. (See panel lower left.)

Customers will be impelled to buy not one or two, but *five* bulbs in one compact package. They'll see instantly the advantage of buying a safer unit to carry—and one that's easily slipped into a home drawer, with bulbs always in one spot, on hand *as soon as they are needed.*

WHAT THE 5-BULB PACK MEANS TO YOU

1. It sells 5 instead of 1 bulb—either factory-packed or self-selected.
2. It builds repeat sales—customer will return to get *his* bulbs in this safer, easier stored Handy 5-Pack.
3. It saves wrapping time and material—when you receive the pack, customer will have his bulb selections already inserted.

Here's a revolutionary method of bulb selling that's *made* to increase profits by speeding turnover and cutting down selling expense!

SYLVANIA ELECTRIC

MAKERS OF FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES

THE FORMULA HAS TO BE RIGHT FOR A LONG, USEFUL LIFE



Only patient, scientific research could have produced a rubber formula combining all the desirable characteristics of Nubun—U.S. Rubber Company's new insulation for wiring.

Extremely tough as well as flexible, this buna compound assures longer life for the wires and cables used in the coming era of intensified electrification. The high dielectric strength of Nubun permits reduction of over-all diameters . . . without endangering circuit integrity . . . allows more wires to be encased in a single conduit.

Nubun will be used in innumerable ways . . . for building and industrial wiring, for control and signal systems and for communication services. Nubun is young . . . but Nubun is headed for a bright future in electricity.

Serving Through Science

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

ANTI-SWAY BUS SUPPORTS

WIRING

Suspended high above the floor in the anodizing department of the Dodge-Chicago Plant, Division of Chrysler Corporation, is a long run of parallel bare copper busbars emanating from a generator room. Paraffin impregnated maple blocks are used as the insulating supports for the double-tier run of eight, ¼-in. by 3-in. copper bars.

The maple block assembly is in three parts. The center section contains eight slots (four on the top and four on the bottom) which seat one-half of each busbar (mounted "on-end"). The bottom and top sections contain matching slots which fit over the rest of the busbar to complete the insulating block assembly. The entire unit rests on a channel-iron strip hanger and is held rigidly in place by three through-bolts with adjusting nuts on top and bottom.

The block assemblies are supported by right angle brackets on adjacent concrete columns wherever feasible. Interim supports—and these are numerous between column locations—are of the trapeze hanger type. Here, the two ½-in. dia. suspension rods, with long threaded portions at the bottom, extend through the maple blocks forming the two outside bolts of the block unit. Tops of these hanger rods are fastened to an angle iron cantilever arm mounted to the underside of concrete beam paralleling the bus run.

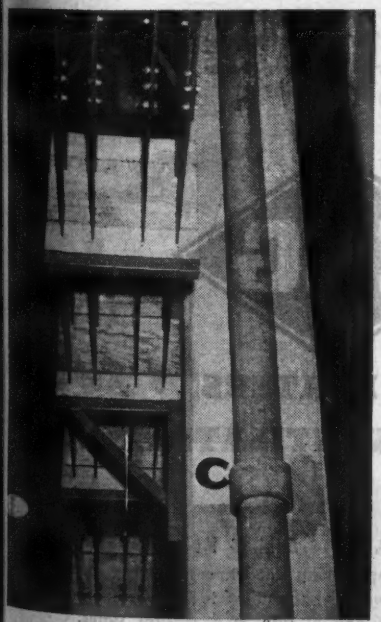


FIG. 1—Maple blocks are used as insulating supports for this run of eight bare busbars in Chrysler Corporation's Dodge-Chicago Plant anodizing department. Note the bracket support on the concrete column.



FIG. 2—Trapeze hangers with anti-sway, double X-braces support the buses between column locations. Hangar rods extend through insulating blocks to form outside bolts of block assembly.

To eliminate sway in the bus assembly, two flat iron X-braces are welded to the hangar rods directly above the maple block unit on all trapeze hangers. This, of course, is not required where the supporting brackets are bolted to the concrete columns.

HOW TO ORDER CABLE POTHEADS

INDUSTRIAL

By P. A. UNVERZAGT
Electrical Department
Allis-Chalmers Manufacturing Company
Milwaukee, Wis.

Ordering potheads as separate pieces of equipment has become an infrequent practice among operators of electrical distribution systems. It is more common now for these important auxiliaries to be furnished by the suppliers of other equipment, such as transformers, disconnect switches, and switchgear. Result is that the advantages of being able to offer complete and accurate specifications for cable entrance fittings have been greatly increased.

Experience with this procedure has indicated that much valuable time can be saved if engineers or purchasing agents responsible for this equipment are in a position to supply complete information with respect to the following important considerations which normally influence the selection of a cable entrance fitting:

1. Size and type of cable being terminated at the pothead.
   (a) Voltage class of cable
   (b) Number of conductors
   (c) Nominal size of conductor and type of conductor insulation
   (d) Type of outside covering on cable, such as lead sheath, braid, rubber, or armor
   (e) Diameter over outside cover of cable
2. Possibility of pothead being connected to rigid conduit.
3. Amount of skill possessed by those who will do the actual work of connecting cables to pothead.

Five of the most common types of cable entrance fittings, supplied by most manufacturers of potheads, are illustrated in the attendant sketches. It is common practice among most manufacturers to make these cable entrance fittings so they may be used interchangeably on potheads, of their own manufacture, having the same size bottom openings and flange drilling. In order to furnish a satisfactory device, the supplier must have certain definite information about cable entrance fittings and the type of cable on which they are to be used. Unless accurate data is given, the function of cable entrance fittings—sealing a cable terminal against entrance of moisture—will be defeated.

The wiping sleeve (symbol "WS") shown in Fig. 1 is the most common type of cable entrance fitting and is seldom used in conjunction with rigid conduit. It is usually made of cast brass or bronze and is suitable for making an ordinary wiped joint between the lead sheath of the cable and the sleeve. It provides a good bond and a tight seal if the wiped joint is properly made. Other types of fittings

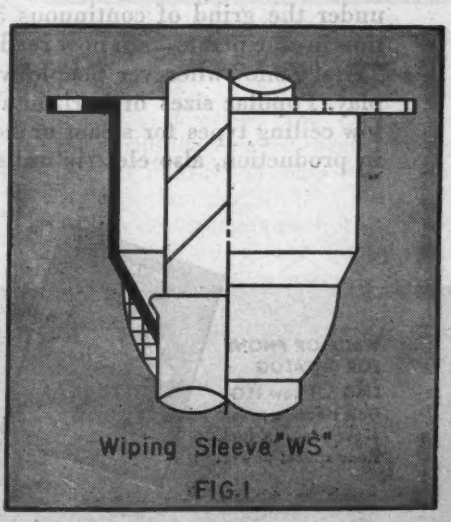


FIG. 1—Wiping sleeve—"WS" type of entrance fitting.

AVAILABLE WITHOUT PRIORITY !

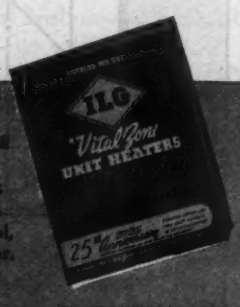


Only ILG Unit Heaters Have Self-Cooled Motors That Never "Slow-Roast"

Now you can specify ILG Unit Heaters for *all* types of applications! These quiet, powerful, efficient, money-saving units have stood up under the grind of continuous 3-shift operation in war plants—are now ready to heat the "Vital Zone" wherever people work, shop or play. Popular sizes of horizontal, vertical or low ceiling types for steam or hot water now in production, also electric units. All backed by "ONE-NAME-PLATE" Guarantee. Write us or phone nearby Branch Office (consult classified directory) for latest specifications.

ILG

UNIT HEATERS AND VENTILATION



WRITE OR PHONE FOR CATALOG
Find out how ILG Unit Heaters save eight ways on fuel, floor space, power.

WANTED: GRADUATE ENGINEERS!
for ILG Branch Offices, Research, and Engineering Departments. Exceptional opportunities now and post-war for graduates of accredited technical schools. Send details on education, experience, health, age, and marital status.

ILG ELECTRIC VENTILATING CO., 2879 N. Crawford Ave., Chicago 41, Ill.
Offices in 40 Principal Cities

are recommended if experienced men are not available, on the job, to make wiped joints.

When ordering potheads with wiping sleeves it is necessary to give the diameter over the lead sheath or sufficient information to calculate this dimension. The minimum amount of information required to calculate the diameter over the lead sheath is: Voltage class of cable; number of conductors; nominal size of conductors; and type of conductors insulation. If multiple conductor cables are of the compact sector type or have a rope core, this information should also be given.

The following example gives information which the supplier needs: 15,000 volt, three-conductor, No. 0000 varnish cambric insulated, lead covered cable, 2.50 inches diameter over lead sheath. Abbreviated this would be: *15KV, 3/C, No. 4/0 VCLC cable, 2.50-in. O.D.*

The clamping ring and stuffing box type of cable entrance fitting (symbol "CR-SB") shown in Fig. 2 may be easily installed on the base of a pothead as it does not require a wiped

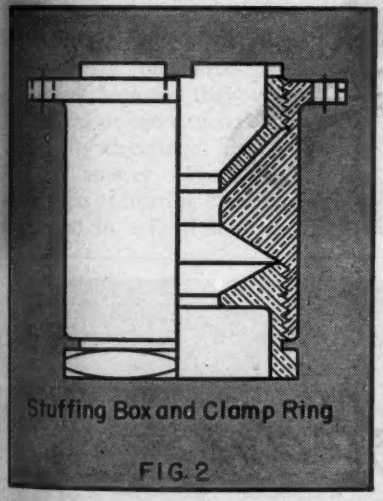


FIG. 2—Clamp ring and stuffing box —"CR-SB" type of fitting.

joint when used with lead sheath cable. The stuffing box seals the pothead against leakage of compound and the clamping ring provides a means of bonding the lead cable sheath to the pothead body.

When ordering potheads with the clamping ring and stuffing box type of cable entrance fitting, it is essential to give the diameter over the lead sheath or sufficient information to calculate this dimension. This is necessary so that the stuffing box may be bored to the proper internal diameter. Example of complete information for single conductor, paper insulated, lead covered cable: *5KV, 1/C, No. 500 MCM, PILC cable, 1.10-in. O.D.*

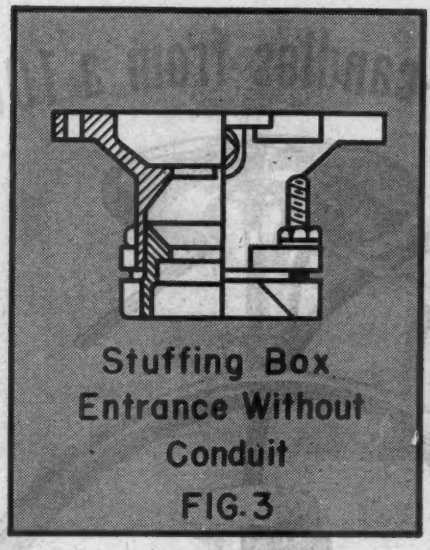


FIG. 3—Plain stuffing box—"SB" fitting.

The clamping ring and stuffing box type of cable entrance fitting may be used in conjunction with a conduit coupling, if cables are run through rigid conduit.

The plain stuffing box type of cable entrance fitting (symbol "SB") shown in Fig. 3 is the most satisfactory type of fitting for use with non-leaded cables such as braid or rubber covered conductors. Various types of packing materials for the stuffing box are supplied by the pothead manufacturer. The particular type of stuffing furnished will be that suitable for the type of cable to be sealed. It is essential, for this reason, to pass along to the supplier, complete cable data.

Example of such complete information for single conductor braid covered cable: *3KV, 1/C, No. 2/0 VC braid covered cable, 0.73-in. O.D.*

The plain bushing type of cable entrance fitting *with conduit coupling* (symbol "PB-CC") shown in Fig. 4

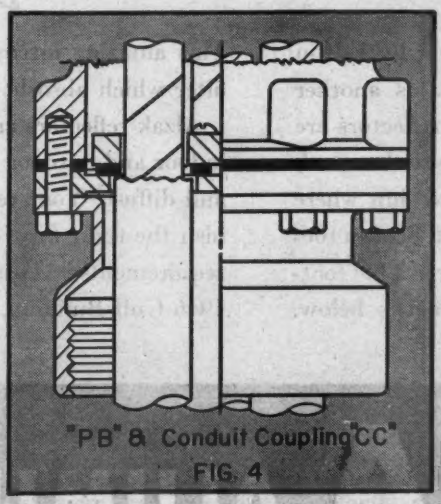


FIG. 4—Plain bushing and conduit coupling—"PB-CC" type of entrance fitting.

is used where a number of single conductor cables are run through rigid conduit and connected to a multiple conductor pothead. This type of fitting is available for lead sheath, rubber covered, or braid covered cables.

Individual holes, bored to proper size, are provided in both discs for each cable. When used with lead sheath cables, the sheath is belled out and clamped between the discs. When used with non-leaded cables, the adjacent faces of each disc are countersunk at each hole to provide a stuffing box for each individual conductor.

Thus it is essential to give such complete cable information as: number of cables, external diameter and type of outer covering on cable together with size of conduit coupling. Example: *Three (3), 5KV, 1/C, 250 MCM, PILC cables, 0.92-in. O.D. with 3-in. conduit coupling.*

The stuffing box and armor clamp type of cable entrance fitting (symbol "SB-AC") shown in Fig. 5 is used when either lead sheath or non-leaded cables are provided with interlocking steel armor. Cables are sealed at the stuffing box in the same manner as

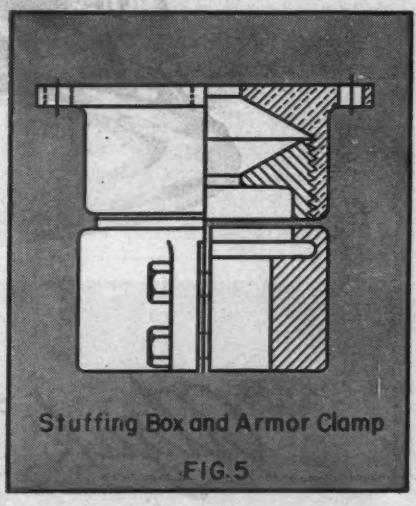


FIG. 5—Stuffing box with armor clamp—"SB-AC" type of entrance fitting.

previously described and the clamp firmly grips the armored covering, providing a measure of support for the weight of the cable.

When this fitting is used, it is necessary to give all of the information previously shown for other types of fittings *plus the external diameter over the armor.* Example: *15KV, 3/C, 350 MCM, VCLC cable with interlocking steel armor, 2.79-in. O.D. over lead sheath; 3.18-in. O.D. over armor.*

In addition to the data discussed above, other information also of pertinent value to the supplier can be furnished by answering the following questions:

Getting 1300 foot-candles from a 100-watt lamp . . .



WITH AN

Alzak *Aluminum Reflector

This Navy operating room light made by Edwin F. Guth Company, St. Louis, Mo., is another example of the job Alzak aluminum reflectors are doing in delivering maximum efficiency and control.

It is used in the surgery on board ship where maximum lighting is vitally important. From a 100-watt lamp, this Guth light delivers over 1300 foot-candles on the operating table 48 inches below. This amazing intensity results in spite of a heat filter which absorbs 24% of the light.

Alzak reflectors are made in various finishes for indoor and outdoor lighting, for spot illumination and diffuse. Your reflector manufacturer can furnish the right type of Alzak to meet your special requirements. ALUMINUM COMPANY OF AMERICA, 1946 Gulf Building, Pittsburgh 19, Pennsylvania.

*Registered trademark

ALCOA

ALCOA ALUMINUM

What is the bare diameter of conductor?

Is the pothead to be mounted in an upright, inverted, or horizontal position?

Is the pothead to be installed on an air or oil filled box?

What type of capnut terminals is desired?

Is a slip joint desirable where rigid conduit is connected to pothead mounted on large equipment?

Catalogs and installation instruction bulletins of all pothead manufacturers furnish many of the answers to these questions and it is suggested that reference be made to them when ordering potheads for new equipment.

HEATING CABLE KEEPS WATER SEAL FROM FREEZING

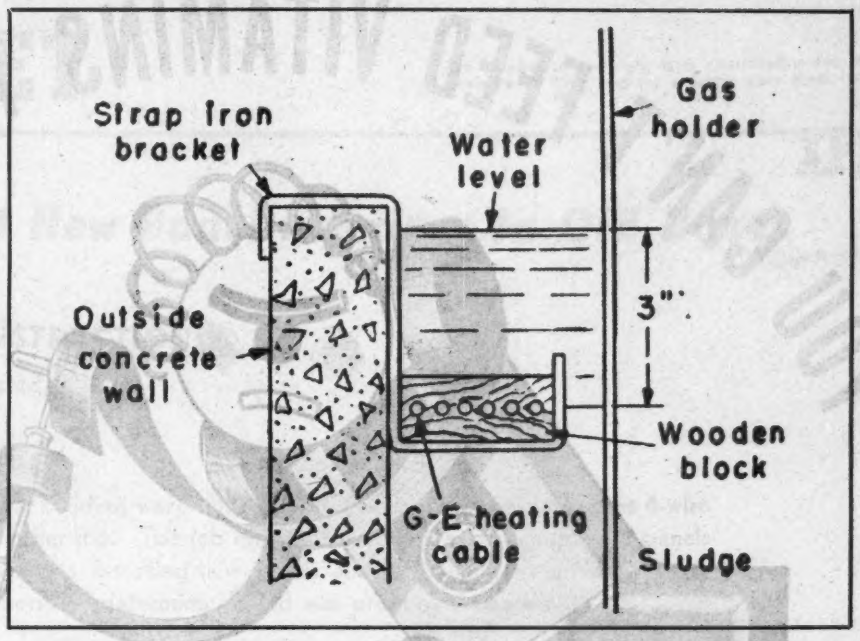
INDUSTRIAL

Immediately after the Sewage Treatment Plant at Lancaster, Ohio began operating (December 1939) considerable trouble was encountered, during the first two winters, due to the freezing of the water seal surrounding the sewage tank. Several solutions to the problem were considered but all were eliminated because they were either impractical or too expensive.

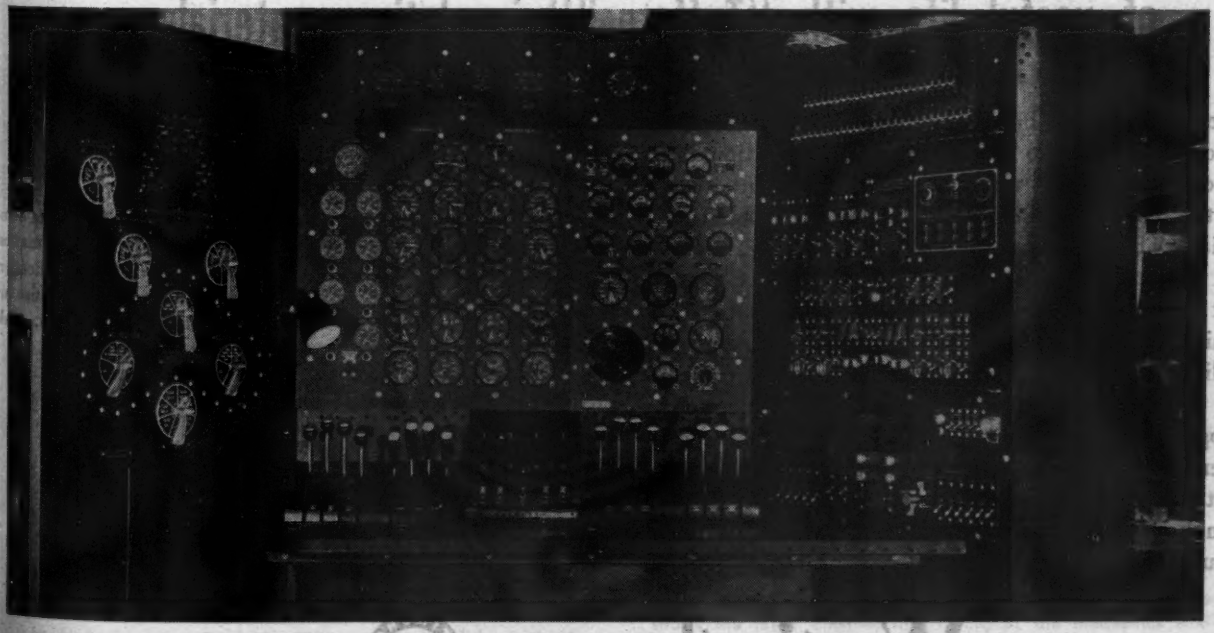
The City electrician finally came up with the answer. He suggested the installation of heating cable to keep the water seal in a fluid state during the cold winter months. After careful consideration his suggestion was adopted because of its low initial cost, low upkeep and simplicity of operation.

The installation consisted of six parallel rows of General Electric heating cable laid on brackets mounted to the circumference of the tank as illustrated in the accompanying sketch. The brackets, made of ¼-in. by 1¼-in. strap iron, were hooked over the top of the outside concrete wall, and so positioned that the cables were submerged approximately three inches below the surface of the water seal between the concrete wall and the wall of the gas holder. The cables, insulated from the iron brackets by wood blocks, were connected to a 220-volt circuit.

During the first winter of operation it was found necessary to use the heaters 24 hours per day only when the temperature dropped below 20 degrees F. Operating cost was approximately five cents per hour—based on a power rate of 1¼ cents per kilowatt-hour.

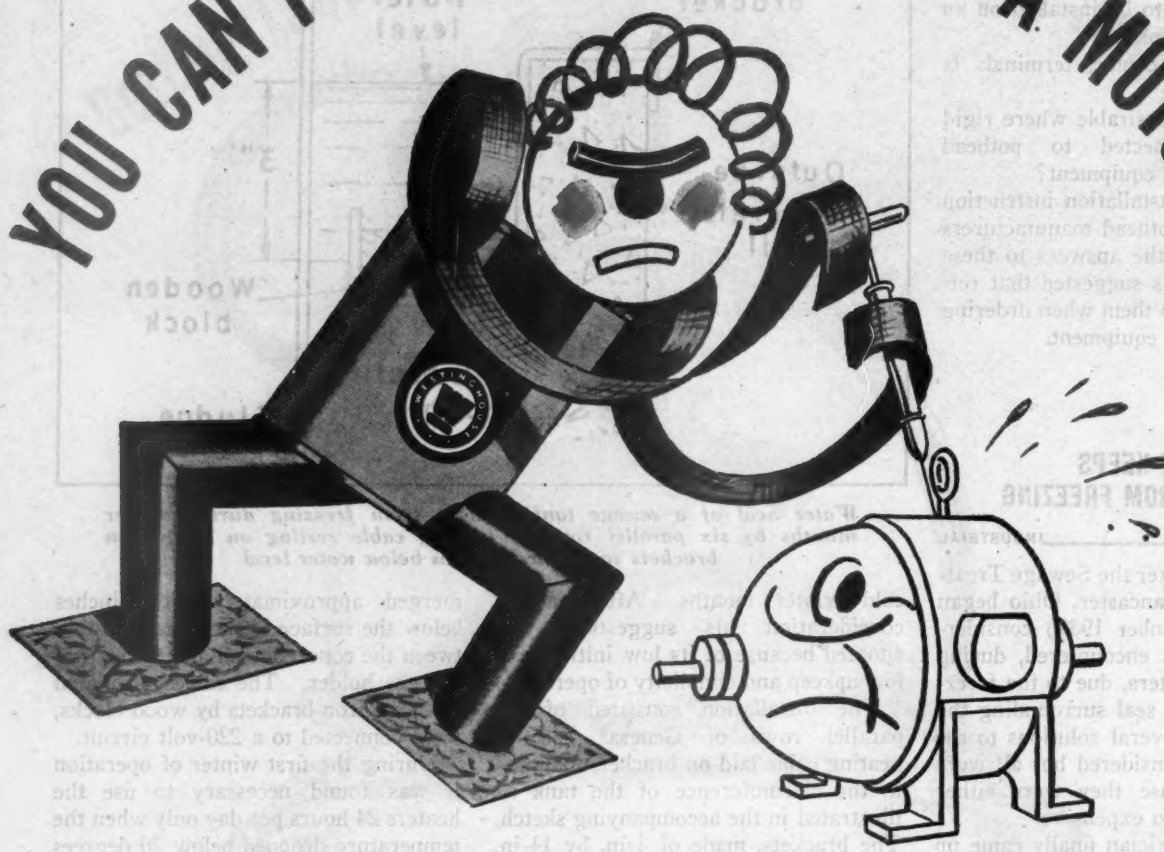


Water Seal of a sewage tank is kept from freezing during winter months by six parallel rows of heating cable resting on strap iron brackets some three inches below water level



Flight Engineer's panel on the huge 85-ton JRM Mars ship, 20 of which are now being built for the U. S. Navy by The Glenn L. Martin Company, Baltimore, Maryland. This massive collection of metal, plastic, dials, switches, lights and wires is more than head high and weighs about 650 pounds. The 2200 wires of various sizes, totalling more than 2½ miles in length, and attached to hundreds of terminals at the rear of the panel, run to all parts of the giant ship. These panels are built entirely outside the ship where precision in workmanship can be maintained. Each of the 2200 wires are numbered, which are later matched with duplicate numbered wires built into the ship.

YOU CAN'T FEED VITAMINS TO A MOTOR . .



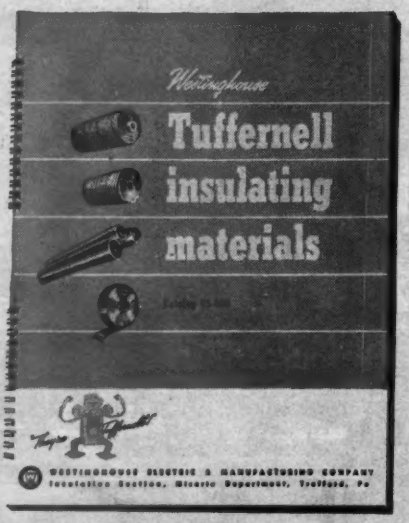
but you CAN restore pep . . .efficiency . . . add years of useful life with "Tuffernell" insulating materials

When you want to bring back your worn and weary electrical apparatus to efficient, normal operation, be sure you get the right materials for the particular job from the complete line of Westinghouse insulating materials. They're "Tuffernell" . . . a complete line of micas, fabrics, varnishes, tapes and papers.

Just added to the "Tuffernell" line is Silicone DC-993, a varnish that approaches Fiberglas, mica and asbestos in ability to resist moisture, heat and corrosive fumes.

Ask your Westinghouse Distributor for a copy of Catalog 65-000 which gives complete information on "Tuffernell" insulating materials, or a copy of B-3601, "Questions and Answers on Silicones". Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-06367



Catalog 65-000 gives complete ordering information and helpful application data on Westinghouse insulating materials. Ask for your copy.

Westinghouse

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Insulating Materials

DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index

XP1

Installation Of New Panel Interiors In Old Boxes

BUILDING CONSTRUCTION:

Labor data not affected.

NATURE OF JOB:

Lighting panels in office building were obsolete. Risers had been retrimmed as 4-wire 3-phase as part of another job. This job involved removing approximately 80 panels from their respective boxes, installing new panels and retrimming. All circuits were checked with an ammeter to determine if load was properly balanced.

JOB CONDITIONS:

Work was done on an overtime basis and no temporary wiring was required.
Panel locations were all accessible and interiors were easily removed.
Main lugs did not have to be removed from cable.

LABOR DATA:

Remove interior, after loosening feeder cables; install new interior; reconnect all branch circuits; reconnect feeder cables to mains; check with ammeter.
Total Time per circuit . . . 0.18 mh.

LABOR ANALYSIS:

This installation had various sized panels with the average number of circuits approximating 32. Job was large and continuous, which aided the units.
If this were a single panel the unit would run approximately *0.30 mh. per circuit.*
If a moderate quantity were to be changed the unit would average approximately *0.25 mh. per circuit.* (This would apply to a quantity of 4 to 10 panels.)
If panel distribution was a problem due to size and weight, *labor consideration would have to be allowed for transportation within the building.*

LABOR CLASSIFICATION:

Two "A" men;
Two "B" men were used on the job.

The types of available labor are rated A-B-C-D-E, with the units based upon average use of B labor. In general, an A man will run the job assisted by B and C labor, which will average class B. In abnormal times the general labor classification will fall to D and E for new labor being employed to fortify the regular personnel. It must be noted that the classification applies only to rate of time and not to knowledge or mechanical ability. A splendid mechanic may be rated C from a rate of time classification.

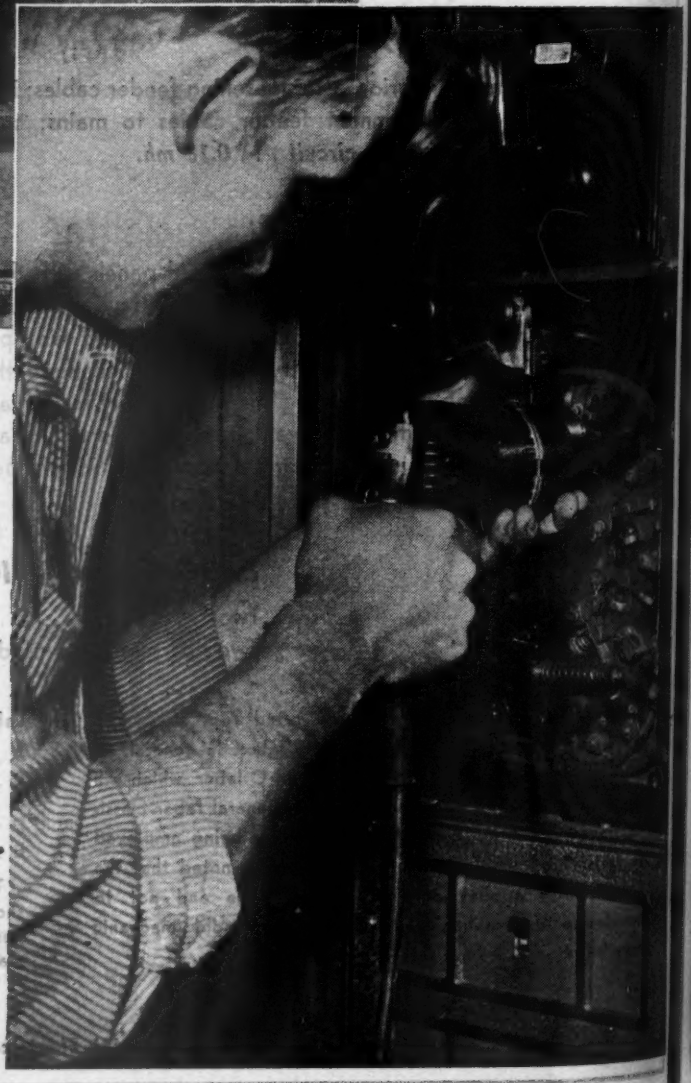
Labor Classification	Changes in Standard Units
A	deduct 10%
B	no change
C	add 10%
D	add 20%
E	add 30%

The labor classification shown in the estimating data above shows the labor classification rating of the mechanics who performed the particular job so that adjustment can be made on the type of labor available.

Data From L. W. Witz, Continental Electrical Construction Co., Chicago, Ill.



Thor put the



WITH A MORE POWERFUL BLOW than any hammer of comparable size and capacity, the Thor-NADO Electric Hammer takes up to a 1" star drill, plus bull points, chisels and many other tools for work in concrete, wood and metal. Heavy-duty universal motor; weighs only 14 pounds; compact and perfectly balanced for easy use in close quarters.

FINGER-POINT ACCURACY is assured with Thor quarter-inch capacity, "midget" type drills. Powered with over-capacity motors, they weigh only 2¼ lbs. and are just 7 inches long.

PORTABLE ELECTRIC TOOLS

SPEED into these Electrical Contracting Jobs that will return post-war profits!

"Big boom" profits ahead are coming to the electric contractors who can handle more jobs because they can do them faster. Figure *Thor* in your plans to get the *speed* these post-war installations will demand. Thor Portable Electric Tools have proved for years they can do *all* installation and repair jobs faster. They combine power and sturdy compactness with amazing handling ease that provides speed and dependable performance wherever they're used. Write today for full catalog details.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Illinois
New York Los Angeles



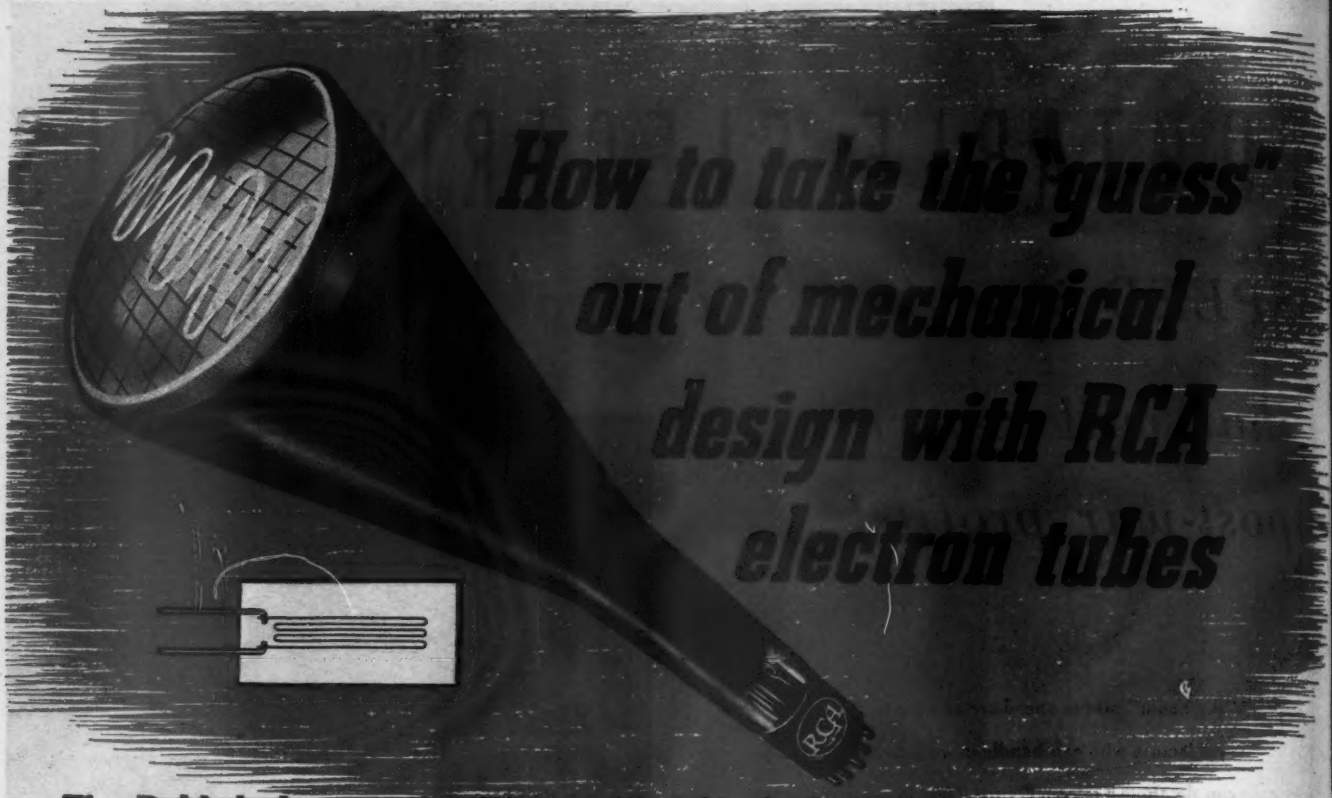
HALF THE WEIGHT, in half the space—with the power of tools twice the size . . . that's the Thor U-44 half-inch electric drill. Light and close-coupled, it is the ideal tool for heavy-duty hole-sawing and drilling in wood or metal floors and walls.

THOR ELECTRIC TOOLS
for Shop and Field

DRILLS . . . HAMMERS . . . GRINDERS . . . SCREW DRIVERS . . . SAWS . . . SANDERS . . . NUT SETTERS . . . NIBBLERS . . . POLISHERS . . . TAPPERS . . . BENCH GRINDERS

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS



The Baldwin Locomotive Works' SR-4 Strain Gage, in conjunction with RCA tubes, measures strains as small as a few millionths of an inch per inch

UNTIL recently, stress and strain in mechanical design could be calculated but could not be accurately measured. This resulted in costly experimentation, and redesigns, before final decisions could be made.

Baldwin engineers found an electronic method of accurately measuring strain that has enabled engineers to design ever closer to the human limits of measurement.

No larger than a postage stamp, the Baldwin SR-4 Strain Gage consists of 5 inches of 1-mil wire cemented to a sheet of thin paper.

HOW IT WORKS: Baldwin gages — often hundreds of them—are cemented to the surface of the structures to be tested. Since the cement used is stronger than the gage wire, infinitesimal movements of the metal under tension or compression cause minute changes in the length and cross-section of the wire.

These changes cause proportional changes in the electrical resistance of the wire. When detected and amplified by means of RCA electron tubes, these changes in resistance can be quickly translated into the desired values of stress or strain, and demonstrated visually on the screen of an RCA cathode-ray tube. The values indicated may be examined on the screen itself, or can be recorded photographically for later study.

APPLICATIONS: Aircraft wings and other structures have been plastered with SR-4 gages inside and out. Stresses developed under simulated loading, or actual use, are accurately measured and recorded. In testing aircraft members, stresses developed during actual flight can be detected by the gages, amplified, and radioed to the ground for recording—not only slowly developed stresses, but flutter strains as well.

With the information thus obtained, engineers can immediately freeze their designs, or modify them as indicated by stress analyses, with full assurance that all guesswork has been eliminated at the start.

ADVANTAGES: The accurate measurements possible with Baldwin gages enable engineers to build with complete safety, yet without excess weight resulting from "over-design" of doubtful structures. Engineering time, machining time, materials, and other factors affecting cost, are greatly reduced by this electronic measuring technique. Weight saved by means of more accurate designing means that aircraft can carry larger pay loads with greater safety; more and more powerful machines can be installed in a given area of floor space without overloading; bridges and other structures can be designed with greater safety than has heretofore been possible.

The low cost, light weight, and simple method of applying the Baldwin gage, mean that scientific measurement of strain is within reach of every designing engineer. Use of the gage does not damage or impair the operation of the structure being measured. For information on this equipment, write to Testing Machine Department, Baldwin Southwark Division, The Baldwin Locomotive Works, Eddystone, Pa.

TURN TO ELECTRON TUBES FOR SOLUTION OF YOUR OWN PROBLEMS: Electron tubes are providing a practical solution to hundreds of diversified manufacturing problems — process-control, machine-control, heat-treating, plant protection, and many more. Cathode-ray tubes, in particular, can be used to make instantaneous measurements of electrical circuit performance; to make continuous observations of a wide range of processes; to compare dimensions, colors, speeds; to measure time intervals as short as one thousandth of a second; in fact, they can observe or measure any quantity that can be converted into voltage or current.

Consult with RCA tube-application engineers for information or advice on uses of electron tubes in industry. For a helpful case-history book on problems solved by electron tubes, write to RCA for a copy of "16 Examples of RCA Electron Tubes at Work in Industry." Address: RCA, Commercial Engineering Department, Section 62-60S, Harrison, N. J.



RCA

RADIO CORPORATION OF AMERICA

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The Fountainhead of Modern Tube Development Is RCA

PRACTICAL ARTICLES on the application, installation and maintenance of electronic apparatus in industry. Readers are invited to contribute items from their experience to this department. Articles used will be paid for.

ELECTRONICS

Maintaining and Servicing Sealed-Ignitron Rectifiers—I

By L. W. Morton
Industrial Engineering Division
General Electric Company
Schenectady, N. Y.

ONE of the important reasons for the widespread use of sealed-ignitron rectifier units is their relative freedom from operating difficulties and, consequently, their low maintenance requirements. Therefore, the reader of this article should not become frightened by the chart of preventive maintenance items or the tabulation of how to remedy possible troubles. These troubles rarely occur, but nonetheless they should be discussed in an article of this type so that the maintenance man can keep his sealed-ignitron unit out of difficulty and with the most reasonable expenditure of time and money.

It is the practice of manufacturers of sealed-ignitron rectifiers to furnish complete instruction books with their equipment. Also, they usually offer field engineering service during its installation. These field engineering groups help the purchaser of the equipment by instructing him how to operate it and, if it becomes necessary, by standing ready to assist in repairing it. This article is not intended to take precedence over these instructions and services. Rather, it is intended to supplement them as far as it is possible for it to do so.

Many sealed-ignitron rectifier units are operated completely unattended. Except where the equipment has been specifically sold as completely automatic, the design is usually based on the expectation that the responsibility for the operation of the equipment would be assigned to some regular operator, usually employed where the rectifier equipment is located or closely adjacent to it. However, the switchgear and control equipment furnished with sealed ignitron rectifiers always incorporates features which fully protect the rectifier equipment, and the systems to which the rectifier may be connected, from both system faults or failures in the rectifier equipment itself. Therefore, many users, knowing this, and finding from experience that rectifier equipment invariably operates without any trouble, adopt the practice of allowing it to operate unattended.

Usually someone in the user's organization is authorized to start and stop the equipment, which in itself is a most simple operation. Sealed-ignitron rectifiers may be placed in operation by the simple expedient of closing first the a-c power circuit breaker and next the d-c circuit breaker. There are no preliminary ceremonies such as operating starting and running breakers,

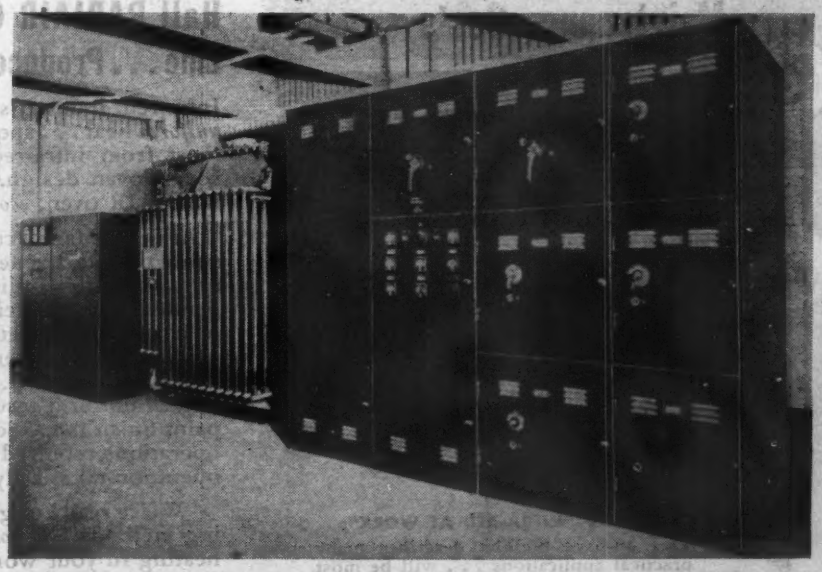


Fig. 1—Stationary, indoor, dead front sealed-ignitron rectifier d-c unit substation, rated 300 kw, 250 volts, d-c, installed in an industrial plant. Illustrated are the four principal components of this equipment: (1) a-c switchgear—metal-enclosed incoming a-c and vertical lift draw-out power circuit breaker contained in first two panels at left; (2) rectifier transformer—Pyranol-filled, self-cooled, throat-connected on both a-c and d-c side; (3) rectifier section—metal-enclosed panel with hinged front door behind which are six 200-amp. sealed-ignitron tubes with excitation circuit and water cooling system, located on right-hand side of transformer; and (4) d-c switchgear—metal-enclosed rectifier control located in lower section and two-pole draw-out air circuit breaker in upper section of third panel from right-hand side. First two panels on right side are draw-out type d-c feeder air circuit breakers.

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synchronizing, or bringing the equipment up to speed. Shutting the equipment down involves the reverse procedure. Therefore, it is not essential that those authorized to start and stop rectifiers should be technical personnel.

These authorized individuals may also be responsible for restarting the equipment in the event of unexpected service interruptions. Such interruptions are those resulting from temporary loss of a-c system voltage, short circuits on the d-c system, or arc-back of the rectifier. Any of these abnormal conditions should cause the a-c and d-c power circuit breakers to open automatically, and ordinarily service can be restored by simply reclosing the breakers.

Since unattended operation as well as starting and stopping by non-technical personnel is allowable, there rests upon the maintenance man an unusual degree of responsibility. Not only must he be prepared to find and repair the ordinary troubles that may occur, but he must also engage in preventive maintenance. The latter means that as far as possible, he must see to it that 100 percent reliable equipment service is provided under unattended operation and normal system conditions. He should try to anticipate and correct all troubles before they occur. Experience with most electric apparatus has proved that this objective may be successfully approached by practicing carefully planned and scheduled preventive maintenance. The art of preventive maintenance for switchgear and transformers has been well known for many years. Since electronic power rectifiers are comparatively new, the need for similar planned and scheduled preventive maintenance for the rectifier part of the equipment is widely recognized. This article contains the well known guides for maintaining switchgear and transformers for ready reference, in addition to suggestions prepared in the same form, but in more detail, relating to the rectifying element.

It is on the assumption that the sealed-ignitron rectifier is operated as a semi-automatic, unattended d-c substation that this article is written.

Sealed-Ignitron Rectifier Applications

Before going into the details of maintenance and servicing, some general educational material relating to sealed-ignitron rectifier units is obviously necessary. Sealed-ignitron rectifiers have been designed to supply d-c voltage to 125-, 250-, 275-, and 600-volt constant potential utilization systems. They are also used for intermediate d-c voltages. In the most popular voltage levels—250 and 275 volts—standard ratings are available from 75 to 501 kilowatts, and at 600 volts the ratings go as high as 1000 kilowatts.

These rectifiers have been used for the following purposes:

D-C Cranes
Ore Bridges
Car Dumpers
Machine Tools
Mining
Printing
Charing Locomotive
Railway Service
Exciters for Rotating Machinery
Electrochemical Processes
Battery Charging
D-C Elevators
Hoists
Electro-magnets
Conveyors

There are two principal forms or arrangements employed in the design of these rectifier equipments. The first is called the stationary type and it is used for all of the applications listed above. Fig. 1 shows a typical example of this equipment. The sky line is generally 90 to 100 inches high. All electric apparatus is metal-enclosed in dead-front cubicles. Standard switchgear, both a-c and d-c of the draw-out or vertical lift type, is employed. Transformers may be either liquid filled (either oil or askerel), using natural ventilation, fans, or water cooling coils in the liquid, or air-cooled. The rectifier part consists of an enclosure with hinged front door or doors behind which 3, 4, 6, 8, or 12 or more water cooled sealed ignitron tubes are mounted, depending on the rectifier rating. In back of the tubes, and accessible through removable back plates or hinged doors, is the ignitor firing or excitation equipment. A system of piping and insulating tubing, together with various thermostats, water pressure or flow relays, and temperature regulating water valves, is also designed into this rectifier section for removing the heat from the sealed tubes. A d-c switchgear and rectifier control section usually contains a draw

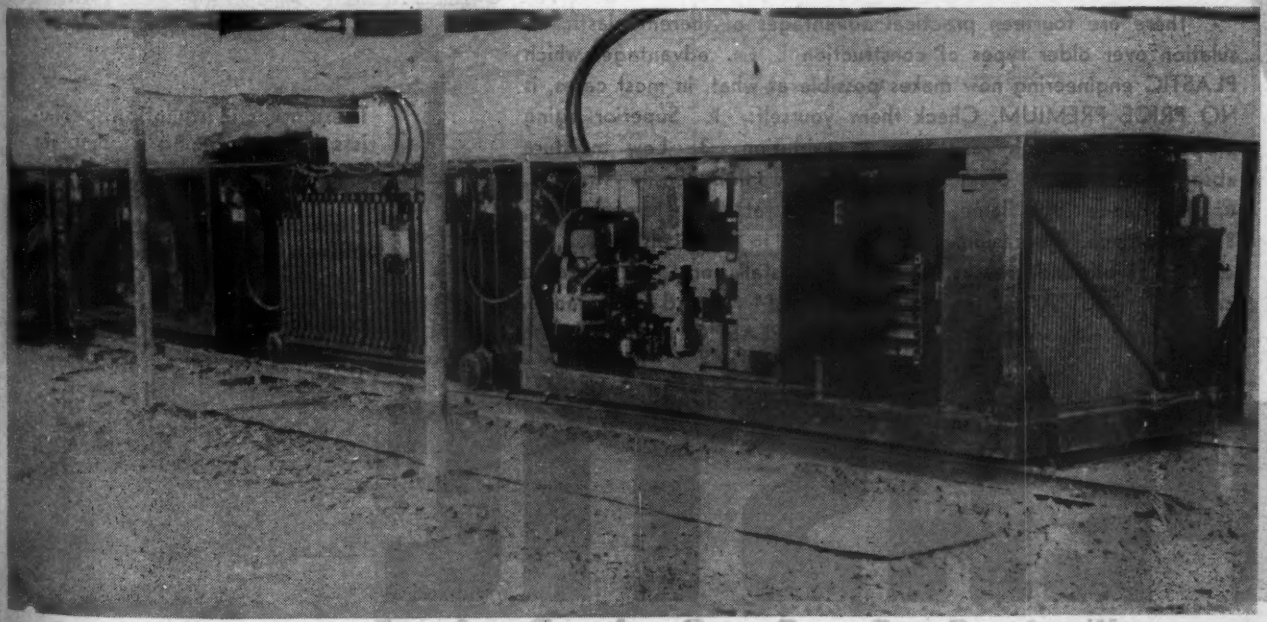
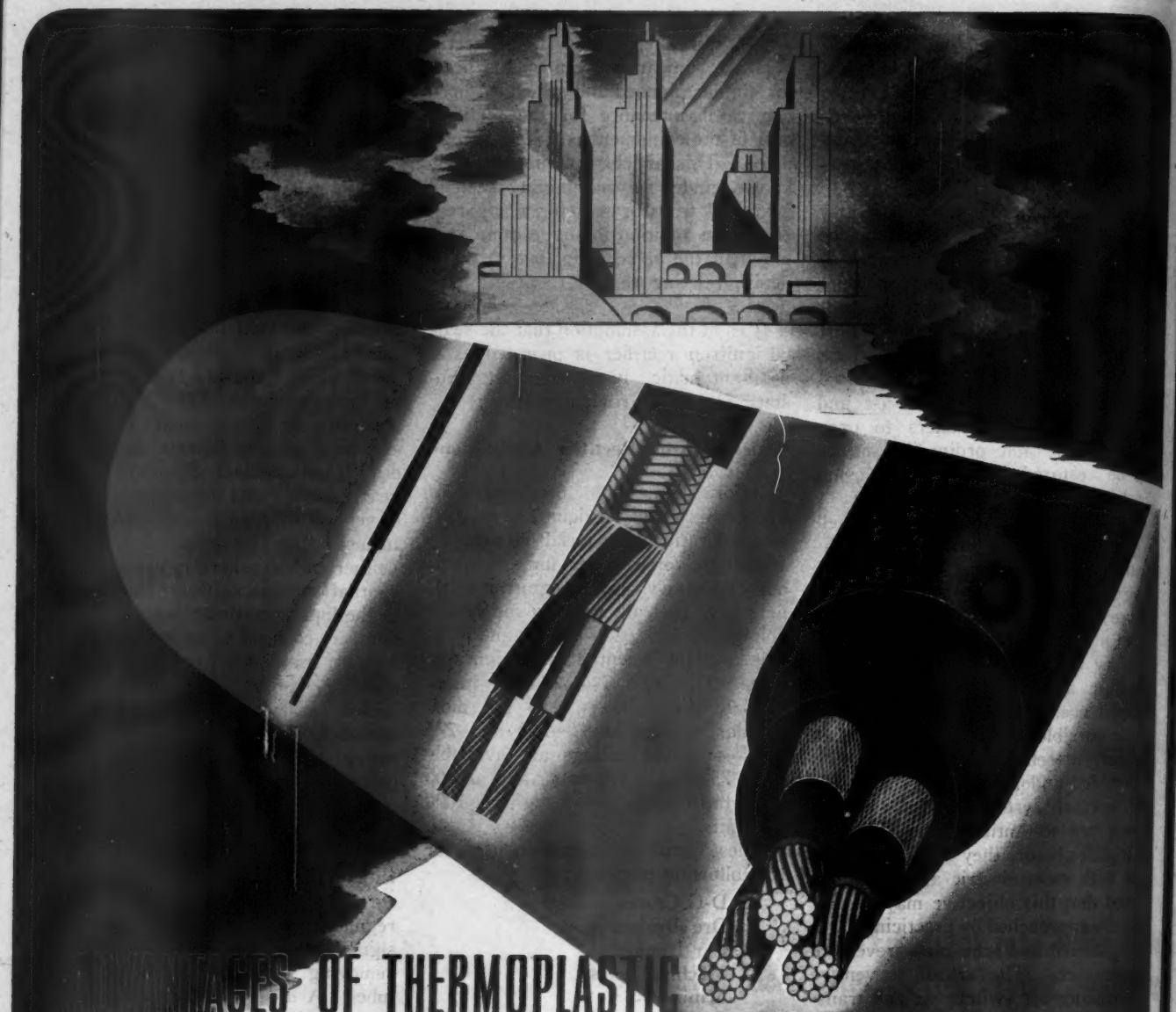


Fig. 2—Portable underground fully automatic sealed-ignitron rectifier d-c unit substation rated 300-kw, 275-volt, d-c, installed in a coal mine. The car on left contains incoming a-c power, automatic a-c power circuit breaker, and auxiliary power transformer. Center car contains 2300-volt, 3-phase, 60-cycle, Pyranol-filled, self-cooled main rectifier transformer. Car on right (d-c car) contains six 200-amp. sealed-ignitron tubes, excitation circuit, water-to-air cooler, and automatic d-c switchgear.



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out d-c breaker, a d-c voltmeter and ammeter, d-c voltage regulator, a d-c voltage control rheostat, various protective and control relays, control power breakers or switches, and sometimes automatic panels for protecting the system in case there is regenerated d-c power—which, of course, a rectifier cannot feed back into the a-c system.

Fig. 2 illustrates the second or portable form, which is used very often underground in mines. These are designed as three separate cars with wheels for drawing along the rails in the mine haulage way. Usually they are low in height—42, 48, or 60 inches—so that they can be easily moved about in mines having seams of various thickness. The three cars contain complete, fully automatic rectifier d-c substations, the a-c gear being mounted on the first car, the rectifier transformer on the second, and the rectifier, tubes, d-c gear, and water-to-air heat exchanger on the third car. These portable underground units are intended to follow the mining operations as near the working face as possible in order to maintain maximum d-c voltage in the working areas.

It can readily be seen that, in effect, both the stationary and the portable forms are d-c unit substations. Either can be readily installed and moved when necessary to locations near the d-c load. Therefore it is possible for the user to reduce his power bills by locating the rectifier strategically, so that the power is brought to the load area efficiently at the high a-c distribution voltages and converted at the load center to the lower and less efficient utilization voltage. In other words, these sealed-ignitron rectifiers should be selected, applied, and used in the same manner as a-c load center stations are, since they are really d-c load center stations and offer all the well known advantages of this type of equipment. As they are usually completely dead-front, metal enclosed, they are safe to install in any location in the plant.

Design of Sealed-Ignitron Rectifiers

The maintenance man should know something about the design features of the equipment which he expects to service. Hence, some of these features will be described; and assuming that switchgear and transformer features are well known to the maintainer, this description will be limited principally to the main power circuit and rectifying element.

Fig. 3 is a one-line diagram of a typical sealed-ignitron rectifier unit. This diagram indicates all the important apparatus that is provided and how it is electrically inter-connected. While this diagram shows six tubes and a delta, six-phase, double wye circuit, and such a combination will be met with most frequently by the maintainer, there are several other combinations that should be mentioned.

These different combinations have been developed to provide the different standard ratings, each with the greatest sealed-ignitron tube utility. Then

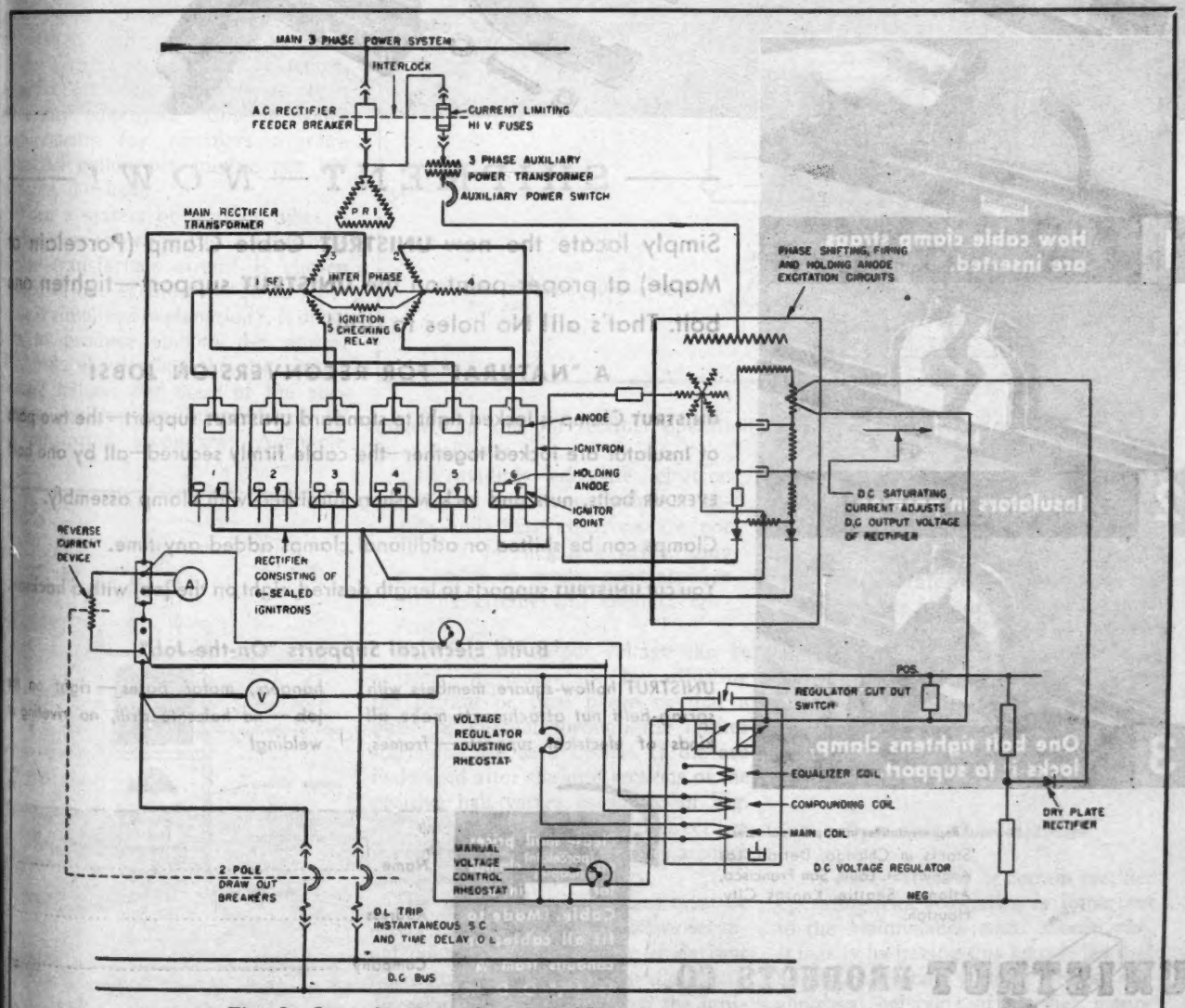
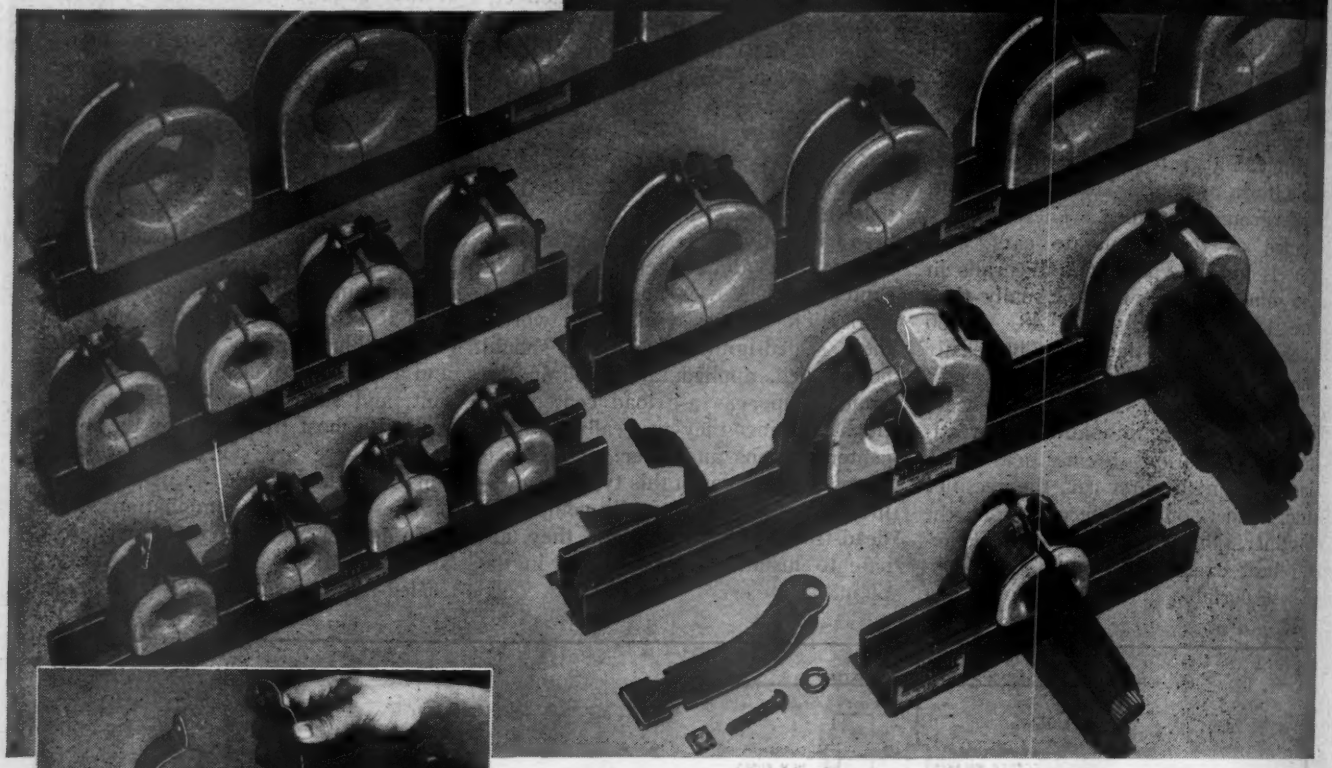


Fig. 3—Line diagram of typical 250 volt sealed-ignitron rectifier.

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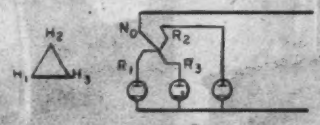
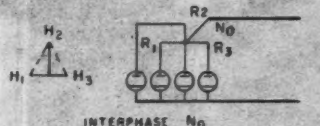
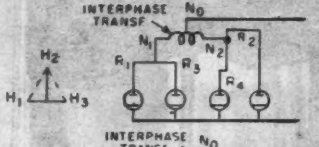
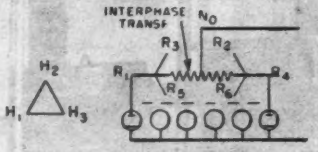
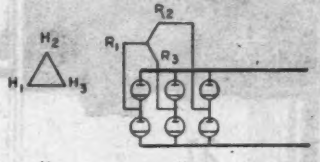
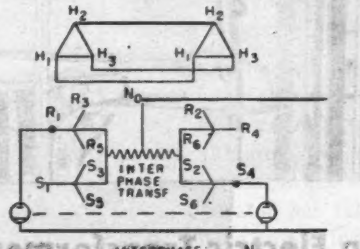
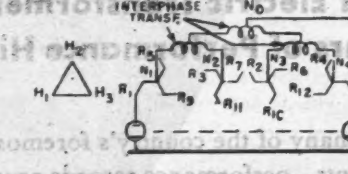
there are several sizes of tubes on the market, namely 100-, 200-, and 400-ampere rating. Obviously by combining different numbers of these tubes in the rectifiers, any desired ratings may be easily obtained. Table I shows several standard tube and circuit combinations. There are, of course, other possibilities that are not so frequently used.

The heart of these equipments, which is the rectifying element, consists of water cooled, single-anode sealed-ignitron tubes (Fig. 4). These are sealed off at the factory. An arc is produced in these tubes at each cycle and at the desired instant, just like the spark plug fires the gas in each cylinder at the right instant in an automobile engine. The spark plug or "ignitor" of the ignitron rectifier is a pencil of boron carbide slightly ($\frac{3}{8}$ inch) immersed in the mercury pool.

Stainless steel is used in the construction of sealed-ignitron tubes, so that raw cooling water, if it is fit for drinking purposes, may usually be used directly in the jackets. When insufficient raw water is available, or its purity is unacceptable, a recirculating system with a treated coolant is used. Either water-to-air or water-to-water heat exchangers are then commonly employed. Cooling water requirements for rectifiers average about 0.4 gallon per minute per 100 amperes, d-c load.

When a system of rectifier tubes is combined as shown in Fig. 5 (this particular transformer circuit is chosen instead of one of those in Table I because it simplifies explanation), it operates to produce smooth d-c power. Fig. 5-A, shows that the d-c output voltage follows the crest of the successive positive waves produced by the transformer secondary. A simple

TABLE I—POPULAR TUBE AND CIRCUIT COMBINATIONS.

		NUMBER OF TUBES
1 - DELTA, 3 PHASE, ZIG ZAG		3
2 - SCOTT, 4 PHASE, CROSS		4
3 - SCOTT, 4 PHASE, DOUBLE DIAMETRIC		4
4 - DELTA, 6 PHASE, DOUBLE WYE		6
5 - DELTA, 6 PHASE, WYE DOUBLE WAY		6
6 - DELTA, 6 PHASE, QUADRUPLE WYE		12
7 - DELTA, 12 PHASE, QUADRUPLE ZIG ZAG		12

underlying rule for rectifier operation is as follows:—

> "Providing adequate electron emission from the cathode is available and these electrons are not blocked by negative grids, only the anode or anodes most positive in the circuit will conduct current."

Rectifier d-c output voltage can be adjusted in magnitude by adjusting the instant or time phase so that a pulse of current through the ignitor starts the arc each cycle. If the arc is delayed after the intersections of the positive half waves as shown in Fig. 5-C, the average output of the rectifier is reduced in proportion to the amount of "phase-controlled" delay.

The ignitor firing impulses must be direct-current, with the positive terminal on the ignitor, because if current flows through the ignitor in the wrong direction it will rapidly burn the ignitor tip off.

Either a-c voltage or negative voltage applied to these ignitors will destroy them.

Fig. 3, "Phase Shifting, Firing, and Holding Anode Excitation Circuits" shows the type of apparatus commonly used to generate the positive impulses for firing the ignitors. The same network provides means for adjusting the time-phase of these impulses and thus adjust the main rectified d-c output voltage. Additional explanation will be given later in this article about how these static magnetic excitation circuits function.

Operating Characteristics

An understanding of certain rectifier operating characteristics is important to the maintenance man. Sometimes, it is only by having this knowledge that he can understand both the normal and abnormal behavior of rectifier equipments.

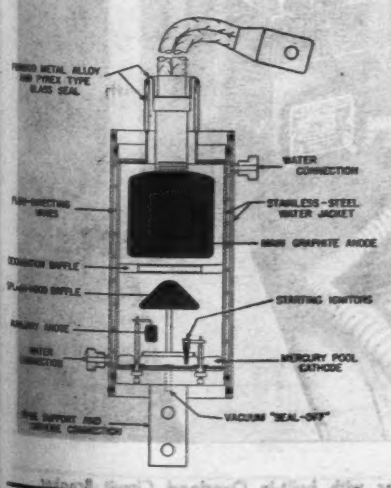


Fig. 4—A typical sealed-ignitron tube, with various parts named.

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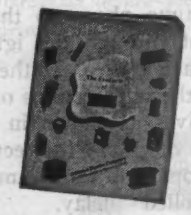
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Power Circuit—Dry Type

In its simplest form, i.e., operating unregulated, the rectifier exhibits the same voltage characteristics that ordinary power transformers or synchronous rotary converters do. That is, its output voltage mirrors the applied input voltage. Rectified output d-c voltage increases and decreases in proportion to the increases and decreases in the a-c system voltage supplying the rectifier.

D-c output voltage droops as the amount of d-c load supplied by the rectifier is increased. The amount of droop or percent regulation depends on the amount of rectifier circuit resistance and reactance, and arc losses in the tubes. The effect of reactance on the rectifier output wave is shown in Fig. 5-B. Conventional rectifiers have drooping regulation characteristics averaging between five and eight percent.

Voltage Regulation

Most sealed-ignitron rectifiers are provided with some form of d-c voltage regulator (See Fig. 3) which automatically controls the amount of "phase control" and hence the d-c output voltage. Both the drooping d-c voltage characteristics and moderate fluctuations in a-c system voltage can thereby be compensated for. The rectifier transformer is designed to give a ceiling d-c voltage under normal a-c voltage and d-c load conditions that exceeds the rated d-c voltage. When used in normal operation, the d-c voltage regulator is adjusted to reduce this ceiling d-c voltage to rated d-c voltage. Then when the a-c voltage dips or the d-c load increases, there is extra d-c voltage available which the d-c regulator can automatically use to maintain the rated d-c output. Ordinarily, such rectifiers will compensate for plus or minus five percent a-c voltage fluctuations.

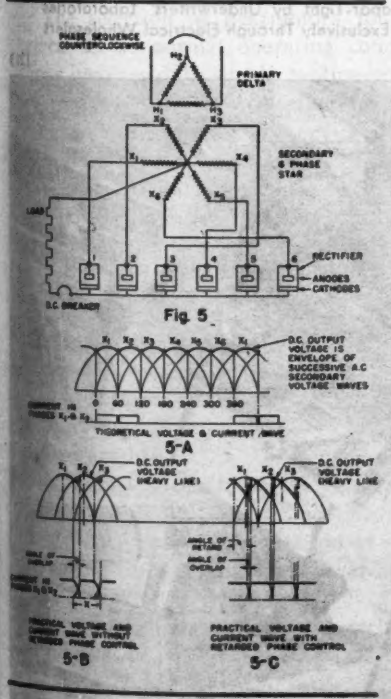


Fig. 5

Fig. 5, 5-A, 5-B and 5-C—Principles of mercury-arc rectifier operation and rectifier wave shapes.

Reference to Table I shows that circuits 3, 4, 6, and 7 have mid-tapped windings interconnecting the various secondary wye and diametric sets of windings. These are obviously balancing coils to cause more than one tube to carry current at a time, and are called interphase transformers. By causing tubes to share load, they improve the utility of both transformer and tubes, thereby increasing rating. However, the presence of an interphase transformer introduces a peculiarity in the d-c output voltage characteristic that the maintainer should know about. This peculiarity is a rapid increase in the natural d-c output voltage characteristic when the load is reduced below 0.5–0.1 percent of rated load. It is known as "light load voltage rise" and may amount to 15–50 percent of the rated d-c voltage, depending on the type of circuit. For most applications, this high light load voltage characteristic is not objectionable since the loads never fall low enough to produce the condition. Most standard rectifiers having d-c voltage regulators compensate for this characteristic by combining a small, permanently connected d-c load on the rectifier with a wide range of phase control which is continuously and automatically adjustable by the d-c voltage regulator.

Maintainers should also remember that the power factor of the rectifier unit is adversely effected by increasing the amount of phase control. A practical rule is that the power factor is reduced in exact proportion to the amount of phase control. If the d-c voltage is reduced 10 percent by phase control, the power factor will be 10 percent lower than it would otherwise be. This means that the maintainer should always try to make the rectifier transformer a-c winding (primary) tap selection, and d-c voltage regulator adjustment, such that a minimum amount of phase control is used to accomplish the desired a-c system voltage and d-c load compensation.

Further articles to follow in this series will discuss installation and maintenance methods for sealed-ignitron rectifiers together with other practical and helpful data.

Controlled Electrical Maintenance

[FROM PAGE 75]

records, and designed to replace worn operating parts before they can cause a production shutdown. Management and production departments can use this as a guide to scheduling production and normal "maintenance shutdowns."

5. Determine, through careful study of parts repairs and replacement, if shutdowns are due to improper installation of parts, inferior materials, or improper operation of the machine. (Much of the wear and tear on motor and control parts—contacts, etc.—can often be traced directly to abuse and rough handling due to improper operation of the machine). Production supervisors can then be advised if the operator needs more training with respect to handling the electrical controls.

6. Reduce individual machine electrical maintenance costs to a minimum by eliminating the underlying causes revealed by an analysis of the maintenance and repair record.

That the human element has a definite bearing on electrical maintenance costs has been indicated in some war plants. Maintenance calls have been known to soar when a new, inexperienced operator has taken over a machine. This cannot justly be attributed to willful abuse, disinterest—call it what you will. More than likely it is the result of *lack of emphasis on how to operate the electrical controls* in the rush to train men for production. This is a condition that must receive attention in the postwar period as well as now. Electrical maintenance records like those discussed will uncover it and the electrical department can do much to remedy the situation.

The maintenance replacement schedule mentioned in Objective 4 is *in addition to the preventive maintenance schedule now in force*—systematic oiling and cleaning of motors, etc. This parts replacement schedule will operate very much the same as the present fluorescent lamp replacement schedules based on determined operating life of the lamps.

The project is an ambitious one and will take much time and energy to complete. The foundation—a simple, workable record system—has been laid.

Although this program has been patterned to the needs of a specific plant, the underlying principles can well be applied to numerous other plants. It warrants careful study and consideration.

Where Keeping Lighting Levels Up and Upkeep Down is Really a Problem, Specify

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1. **HOUSING,** heavy gauge, porcelain enamel steel, specially processed to resist corrosive atmospheres; protects reflector against damage from flying particles or rough handling.
2. **REFLECTOR,** multi-conical Alzak aluminum, specially designed for the most exacting, efficient light control; in three arrangements to provide three forms of light distribution.
3. **GLASS COVER,** resists heat; unaffected by severe temperature changes; four times stronger than ¾ inch plate glass; won't shatter under hammer blows!
4. **COVER SEAL,** protects interior from dust, moisture, corrosive gases; special hinged construction, facilitates opening and servicing.

Selection and Application of Gearmotors—II

This concluding article on gearmotors outlines methods of selecting units for industrial applications and presents suggested installation and maintenance precautions.

By W. P. Schmitter Chief Engineer* and *H. W. Kayser** Development Engineer*
The Falk Corporation
Milwaukee, Wis.

THE Standards of the American Gear Manufacturers Association for ratings of gearmotors are based on sound engineering principles. Under normal operating conditions a gearmotor designed and built in accordance with these standards can be expected to give long and trouble-free service providing the correct size is chosen and properly installed and cared for.

Selecting Correct Unit

The selection of gearmotors for a given set of normal operating conditions involves only simple routine procedures. Gearmotor selection tables for the three classes of service discussed in the first installment of this article are published by most gearmotor manufacturers. An outline of the steps essential to a proper gearmotor selection follows:

1. Select standard output speed nearest to specified output speed from Table I (See Part I).
2. Determine class number from the Application Classification Table II (See Part I).
3. Using manufacturers selection table for the class determined above, find proper gearmotor selection at intersection of specified horsepower and output rpm.
4. If the low speed shaft is other than coupling connected, calculate overhung load and check value against allowable given in manufacturers table.

In some industries it is common practice to express load in terms of torque in which case it is necessary to convert to an equivalent horsepower and then make the unit selection in the aforementioned manner.

There are a few extraordinary gear applications such as run out table drives, vibratory screens, etc., where the service is extremely severe and shock loads are predominant. These drives often have motors with high starting torques and require frequent starts and stops. The motors may be designed for plugging or be equipped with electric brakes. *Applications of this nature should be referred to the gearmotor manufacturer for proper selection.*

The following three examples cover in detail the procedure to follow in making a selection for typical gearmotor applications:

Example 1.

Given: 10 h.p. gear type oil pump to operate at 230 rpm. at a normal requirement of 8 to 10 hours per day. Flexible coupling connection between gearmotor and pump.

Procedure: The application as listed in the Application Classification Table (See Part I) is for Class I service so Table III is used. In the 10 hp. column trace vertically downward to the unit designation opposite 230 rpm. The proper selection is a 10341-DU Gearmotor.

Example 2.

Given: Belt conveyor headshaft drive, running at 40 rpm. at which the required torque is 7500 in.-lb. Continuous 24 hour duty. Single strand roller chain drive from reducer to conveyor headshaft; 6.71-inch pitch diameter sprocket on reducer and 16.88-inch sprocket on headshaft.

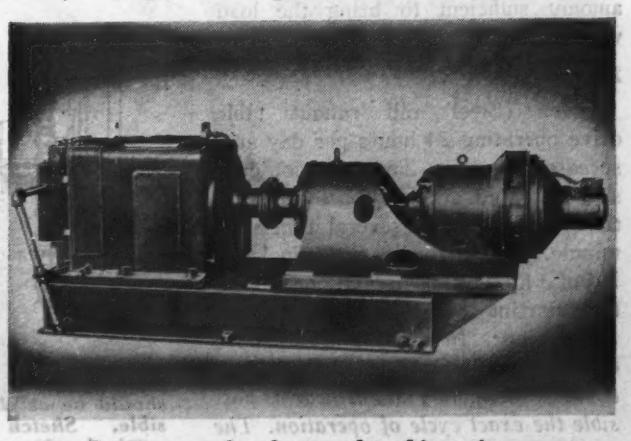


Fig. 7—Heavy sole plate under this unit prevents vibration. The 25 hp. Adjusto-Spede gearmotor drives a hydraulic pump at 0 to 121 r.p.m.

* *Chairman, Tooth Form Committee, AGMA*
** *Chairman, Helical and Herringbone Gear Committee, AGMA*

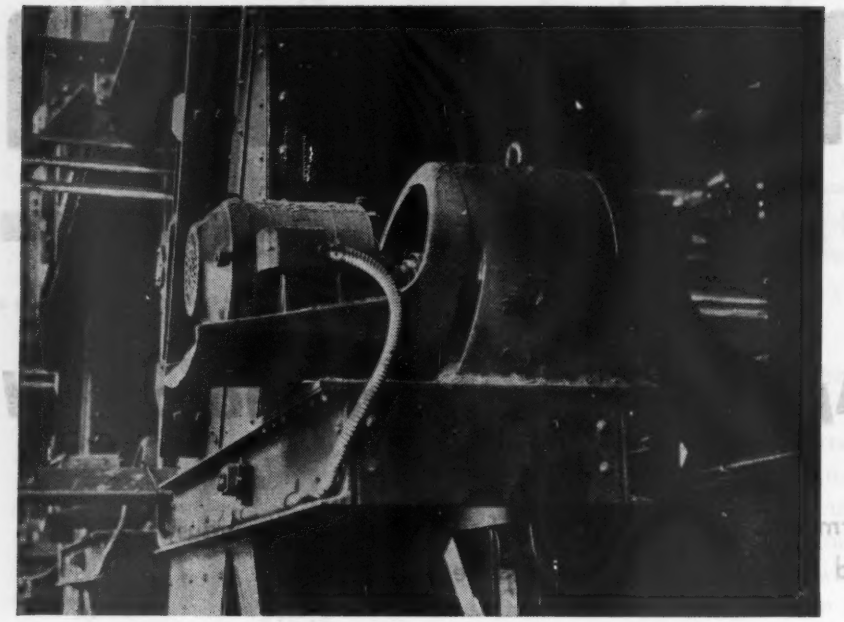


Fig. 8—Steel frame shelf provides solid mounting for this 2 hp. triple-reduction gearmotor driving a refuse elevator at 13.5 r.p.m.

Procedure:

$$\text{Equivalent hp.} = \frac{\text{Torque x RPM}}{63{,}000}$$

$$= \frac{7{,}500 \times 40}{63{,}000}$$

$$= 4.75\text{—(Use 5 hp.)}$$

$$\text{Gearmotor speed} = 40 \times \frac{16.88}{6.71} = 100$$

Refer to Table IV which is for Class II service. In the 5 hp. column trace vertically downward to the unit designation opposite 100 rpm. The proper selection is a 5282DU. Check for overhung load as follows: (using formula in Part I).

$$L = \frac{63{,}000 \times 4.75 \times 1.0}{100 \times 3.35} = 891 \text{ pounds.}$$

Compare this with allowable value from the selection table II. If the allowable value is exceeded, the sprocket size should be increased an amount sufficient to bring the load within the capacity of the unit.

Example 3.

Given: Steel mill runout table drive operating 24 hours per day at a speed of 350 rpm. The operation consists of rapid accelerations, decelerations, and reversals several times per minute. The motor has a nominal rating of 3 hp. but is a special one having high starting torque characteristics.

Selection: In addition to the above data *it is necessary to have a torque curve of the motor, and as near as possible the exact cycle of operation. The unit selected should be Class III based on the maximum peak for acceleration or deceleration, whichever is higher. Manufacturers' engineers should be consulted in arriving at a final selection.*

Installation Precautions

After the proper type and size of gearmotor has been selected to fit the specific application at hand, long life and satisfactory efficient operation will be dependent, to a substantial degree, upon correct installation and subsequent periodic maintenance. When installing a unit, it is desirable to keep in mind the following precautions.

Proper Mounting

Even though the gearmotor is manufactured to very precise limits of accuracy, it is a very rugged piece of equipment and will withstand heavy loads. The user however should exercise a reasonable amount of care in the installation, operation and maintenance, to realize the maximum in trouble-free service.

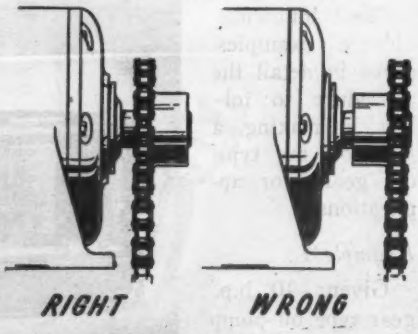


Fig. 9—Load application point should be as close to unit as possible. Sketch illustrates correct method of mounting an "offset hub" sprocket to a gearmotor output shaft.

The installation of a gearmotor should be handled similar to that of an electric motor. The mounting should be such that the unit can be moved bodily from the foundation and taken to a shop should repairs ever be necessary. A rigid sole plate or structural steel frame such as shown in Figures 7 and 8 makes an excellent foundation. When a concrete foundation is used, the gearmotor should not be grouted in, but the concrete should be allowed to set before bolting down.

Care in Coupling

The connection between the gearmotor output shaft and the driven equipment should be very carefully made as this has an important bearing on the life of the gears and bearings. For flexible coupling connections, the limits of alignment should be in accordance with the coupling manufacturer's recommendation which is usually a few thousandths of an inch. It should be kept in mind that *the misalignment features of a flexible coupling are intended only to compensate for settling of foundations, minor wear in bearings, etc.*

Sprockets, pinions, and pulleys should be mounted such that the point of application of the load is as close to the unit as possible (see Figure 9). In this manner the shaft stress and the bearing loads are held to a minimum. *For the conventional gearmotor, the life expectancy of the low speed shaft bearings may be reduced by 50 percent or more when the load is placed at the end of the shaft* as compared to one where the load is applied at the center of the shaft extension. For sprocket and pulley connections, proper consideration must be given to alignment and initial tension to avoid undue bearing loads and premature wear of chain.

The alignment of gear drives such as shown in Figures 11 and 12 is usually made by coating the tooth profiles with *bluing, lampblack, or red lead* and then observing the contact made when slowly moving one member through a complete revolution. Adjustments in the position of the reducer are then made and the above procedure repeated until correct contact is obtained.

Sprocket pinion and pulleys should be heated and shrunk on the output shaft rather than driven on, as a hammer blow may result in damage to the gears and bearings inside the reducer.

Use of Outboard Bearings

On applications where it is necessary

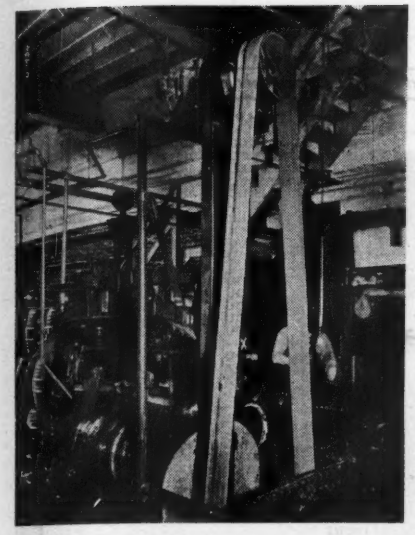


Fig. 10—Proper belt tension is provided by an idler pulley at base of this keg scrubber. Driving unit is 5 hp., 125 rpm, Integral gearmotor with flat pulley on output shaft.

to mount a sprocket some distance from the reducer or where a wide pulley is required, an outboard bearing should be used (see Figure 13). This bearing block should be of the extensible or floating type and should be aligned with extreme care to avoid severe shaft stresses and bearing preloads.

Provide Belt Adjustment

A convenient method for making provisions to adjust the tension of belts and chains is the use of slide rails such as shown in Figure 14. These rails are identical to those used with electric motors and are offered as a standard item by most gearmotor manufacturers. Reasonable care must be exercised in the use of this and other chain tightening devices, as *too tight a chain may exert loads on bearings and shafts many times greater than the transmitted load.*

Maintenance Suggestions

Gearmotor maintenance is simply a matter of maintaining proper lubrication and checking periodically for indications of misalignment or abnormal mechanical wear of the gears. Of course, the electric motor should be given the conventional maintenance care to preclude an electrical failure. The following suggestions apply to the mechanical maintenance of the unit.

Suitable Lubrication Important

Horizontal gearmotors are made with oil tight housings, the lower portion of which acts as a sump or reservoir. The oil level is carried at a height such that the gear elements are partially submerged but low enough so that the oil will not run out at the shaft extensions. This simple but positive method of lubrication provides an ample film of oil for the gear teeth and bearings at all times.

As mentioned in the preceding article, the vertical type units are designed with a positive sealing arrangement at the low speed shaft and employ a pump to lift the oil to the upper portion of the gear chamber from which it is distributed to the gear meshes and to the bearings. *These units usually require grease lubrication for one or more of the bearings.*

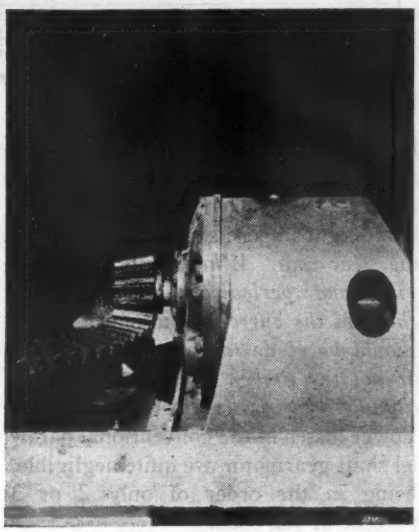


Fig. 11—Long life of this high ratio bevel gear set and gearmotor drive is assured through careful alignment.

In accordance with the Standard Specification of the American Gear Manufacturers Association for the lubrication of gearmotors, the oil used should have the following Saybolt Universal Viscosities:

1. For ambient temperatures of 0° to 40° F.—S.U.V. of 280 to 360 seconds at 100° F.
2. For ambient temperatures of 41° to 100° F.—S.U.V. of 700 to 1000 seconds at 100° F.
3. For ambient temperatures of 101° to 150° F.—S.U.V. of 80 to 105 seconds at 210° F.

A high grade well refined straight mineral oil of the industrial type is recommended for normal applications.

The areas of contact on gear teeth are relatively small and the unit pressures produced in transmitting the loads are proportionately high. It is therefore necessary to maintain an adequate supply of clean oil at all times.

As gearmotors are shipped from the factory without oil it is necessary to fill to the proper level before starting. Thereafter, for reasonably clean atmospheres it is sufficient to *change oil once every six months or every 2500 hours of operation,* whichever occurs first. For operation *in atmospheres which are heavily laden with moisture, dust or chemical fumes, the oil should be changed every two to four months* depending on the severity of the contamination. The so-called dust and water seals at the shaft ends are not

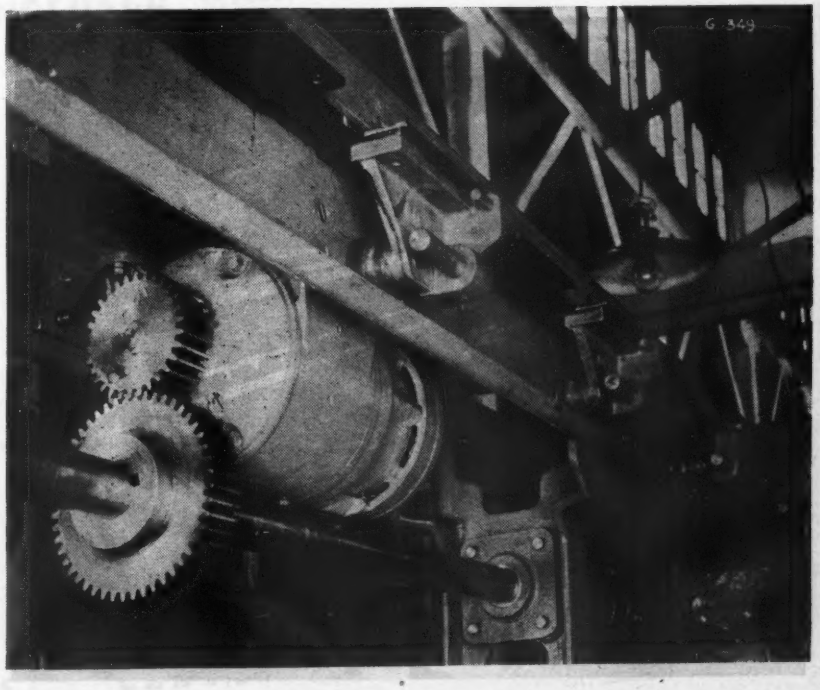


Fig. 12—Spur gear drive by a 5 hp., ceiling-mounted, gearmotor operates this reducer shaft on a continuous mill at 56 rpm. Critical alignment of gears and shaft is vital to efficient operation.

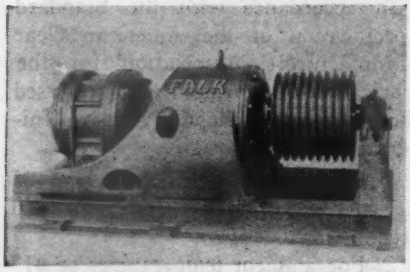


Fig. 13—Outboard bearing supports extended shaft of this double reduction gearmotor. Wide V-belt sheave required the additional bearing. Unit is a 20 hp., 1750 to 159 r.p.m. Allmotor type.

100 percent effective in preventing the ingress of foreign matter.

When making an oil change the proper procedure is as follows:

1. Drain the old oil.
2. Flush thoroughly with a light flushing oil.
3. Refill to the proper level with new oil.

It is not necessary to dissassemble the reducer when making an oil change as the flushing oil removes foreign particles and traces of sludge that may be present.

Check Operation Regularly

Gearmotors require very little maintenance other than the aforementioned oil changes and a periodic check of the oil level. All outside bolting should be kept tight and the unit given a superficial examination at regular intervals for quiet and smooth operation.

Table IV—Selections for Class II Gearmotors

1750 R.P.M. MOTOR SPEED — ALL-MOTOR TYPE FOR USE WITH ANY TYPE MOTOR							
R.P.M.	1 H.P.	1½ H.P.	2 H.P.	3 H.P.	5 H.P.	7½ H.P.	10 H.P.	15 H.P.
1430	1202LU	1.5202LU	2202LU	3202LU	[illegible]	7.5252LU	10282LU	15282LU
1170	1202LU	1.5202LU	2202LU	3202LU	5222LU	7.5252LU	10282LU	15282LU
960	1202LU	1.5202LU	2202LU	3202LU	5222LU	7.5252LU	10282LU	15282LU
780	1202LU	1.5202LU	2202LU	3202LU	5222LU	7.5252LU	10282LU	15282LU
640	1202LU	1.5202LU	2202LU	3202LU	5222LU	7.5252LU	10282LU	15282LU
520	1202LU	1.5202LU	2202LU	3202LU	5222LU	7.5252LU	10282LU	15282LU
420	1202LU	1.5202LU	2202LU	3202LU	5222LU	7.5252LU	10282LU	15282LU
350	1202LU	1.5202LU	2202LU	3222LU	5252LU	7.5252LU	10282LU	15322LU
280	1202LU	1.5202LU	2222LU	3222LU	5252LU	7.5282LU	10282LU	15322LU
230	1222DU	1.5222DU	2222DU	3252DU	5252DU	7.5282DU	10342DU	15342DU
190	1222DU	1.5222DU	2222DU	3252DU	5282DU	7.5282DU	10342DU	15342DU
155	1222DU	1.5222DU	2252DU	3252DU	5282DU	7.5282DU	10342DU	15342DU
128	1222DU	1.5222DU	2252DU	3252DU	5282DU	7.5342DU	10342DU	15402DU
105	1222DU	1.5252DZ	2252DU	3282DZ	5282DU	7.5342DU	10342DU	15402DU
84	[illegible]	[illegible]	2252DU	3282DZ	5342DZ	7.5342DU	10402DU	15442DZ
68	1252DZ	1.5252DZ	2282DZ	3282DZ	5342DZ	7.5402DZ	10402DU	15442DZ
56	1252DZ	1.5282DZ	2282DZ	3342DZ	5342DZ	7.5402DZ	10442DZ	15562DZ
45	1252DZ	1.5282DZ	2282DZ	3342DZ	5402DZ	7.5442DZ	10442DZ	15562DZ
37	1252RZ	1.5282RZ	2282RZ	3342RZ	5402RZ	7.5442RZ	10442RZ	15562RZ
30	1282RZ	1.5282RZ	2342RZ	3342RZ	5402RZ	7.5442RZ	10562RZ	15562RZ
25	1282RZ	1.5282RZ	2342RZ	3402RZ	5442RZ	7.5562RZ	10562RZ	15702RZ
20	1282RZ	1.5342RZ	2342RZ	3402RZ	5442RZ	7.5562RZ	10562RZ	15702RZ
16.5	1282RZ	1.5342RZ	2342RZ	3402RZ	5562RZ	7.5562RZ	10702RZ	15702RZ
13.5	1342RZ	1.5342RZ	2402RZ	3442RZ	5562RZ	7.5562RZ	10702RZ	.....
11.0	1342RZ	1.5402RZ	2402RZ	3442RZ	5562RZ	7.5702RZ	10702RZ	.....
9.0	1342RZ	1.5402RZ	2442RZ	3562RZ	5562RZ	7.5702RZ	.....	.....
7.5	1402RZ	1.5442RZ	2442RZ	3562RZ	5702RZ	.....	.....	.....

However, it is often necessary to make a more thorough examination of the connected equipment as a deficiency here might impose severe overloads on the gear unit. *When first starting a unit, and periodically thereafter, a check of the current flow to the motor should be made to determine whether or not the driven equipment is functioning properly* (ammeter load test). Power losses in the conventional parallel shaft gearmotor are quite negligible, being in the order of only 2 or 3 percent at full load.

Investigate Abnormal Noise

The sound level of commercial gearmotors operating at full load and speed will vary. For most units, however, it *will be between 80 and 90 decibels (DB) as measured 12 inches from any point on the housing.*

If the sound level should materially increase after an extended period of service, an investigation should be made immediately. It may be that the driven machine is not functioning properly and requires additional power which is overloading the gear unit. If an investigation indicates that the connected equipment is in proper alignment and good operating condition, this would constitute sufficient evidence that the trouble is in the gear unit itself.

Avoid Excessive Temperature Rise

The temperature rise in a gearmotor need not ordinarily be cause for concern as the design of the housing is such that there is sufficient area to dissipate the heat generated at the bearings and gear mesh. However, for normal operating conditions *if the temperature of the oil or any part of the housing should go up to 170° to 175° F., there is an indication that something is wrong.* It may be caused by too high or too low an oil level, severe overload, coupling misalignment, or faulty bearings within the gear unit.

Some fifteen years of extensive background with gearmotors in diversified industries testifies to their complete reliability. The ratings are conservative and consistent selections can be made from the standardized procedures developed by AGMA. With ordinary care gearmotors can be expected to fulfill their intended function without undue noise, vibration, or wear for the life of the associated equipment.

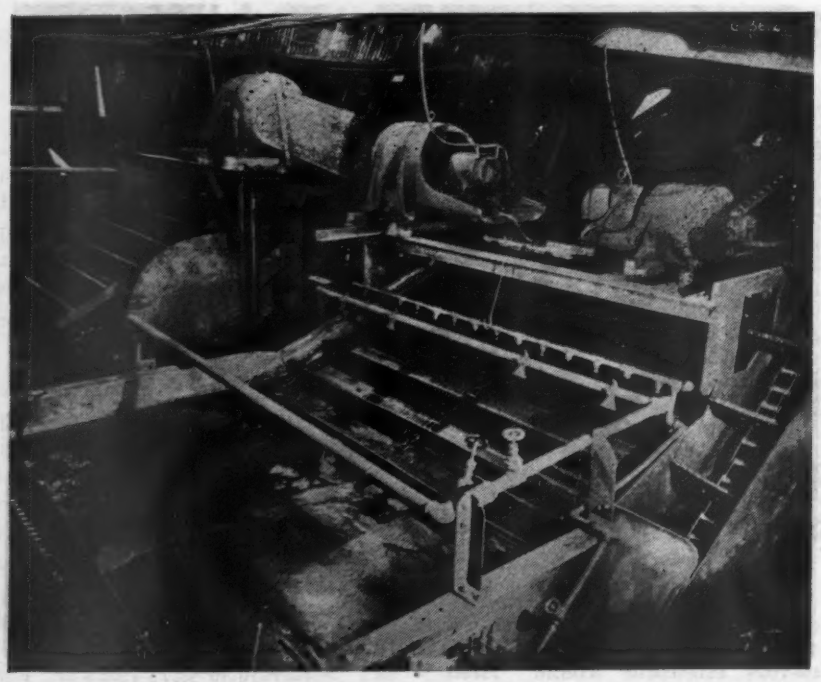


Fig. 14—Slide rail mounting of these gearmotors driving a coal washer permits quick and easy adjustment of tension on the single strand roller chain drives.

15 horsepower Century Totally Enclosed Fan Cooled Motor driving a multiple spindle automatic lathe. This motor is protected against dust, chips, and coolant mist.



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The thorough protection of the vital parts of Century Totally Enclosed Fan Cooled Motors guards against such destructive forces as abnormal amounts of metallic and abrasive dusts, metal cuttings, coolant fog or mist, oil-laden factory dust, chips, etc.



The inner sealed frame of these motors prevents destructive, dust-laden atmosphere from getting into the motor.

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S-7

Suggested Symbols for Electrical Drawings — IV

SYMBOLS FOR SWITCHES AND PANELS

WALL $	Single pole toggle switch
$\$_2$	Double pole toggle switch
$\$_3$	Three way toggle switch
$\$_4$	Four way toggle switch
2$	Two single pole toggle switches in two gang arrangement. Numeral indicates number of switches
$\$_D$	Automatic door switch
$\$_E$	Electrolier switch
$\$_K$	Key operated switch
$\$_P$	Single pole switch and pilot lamp
$\$_{CB}$	Wall air circuit breaker
$\$_{BCB}$	Branch circuit — air circuit breaker
$\$_{WCB}$	Weatherproof — wall air circuit breaker
$\$_R$	Remote control switch
$\$_{MC}$	Momentary contact switch
$\$_W$	Weatherproof switch
$\$_{EXP}$	Explosion-proof switch

WALL $\$_{VP}$	Vapor proof switch
$\$_S$	Motor starting switch for fractional hp. motor
S	Combination motor starter — safety switch and magnetic
S	Motor starter for other than fractional hp. motor
	Air circuit breaker (panel)
	Lighting panelboard cabinet
	Power panelboard cabinet (local)
	Power distribution panel (feeder)
	Bell Tel. Co. — interconnecting cabinet
	Interphone — interconnecting cabinet
	Cable supporting box
	Transformer
	Meter
S_O	Sash motor operator
	Magnetic relay
	Safety switch—size—type—fused or unfused noted on drawing or in specifications

Information from L. W. Seitz, H. E. Saylor Corp., Detroit.



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INSULATED WIRE CO.
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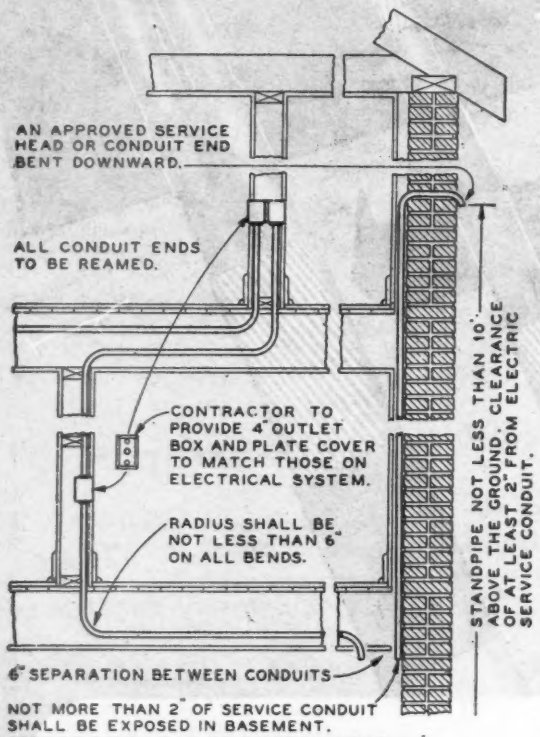
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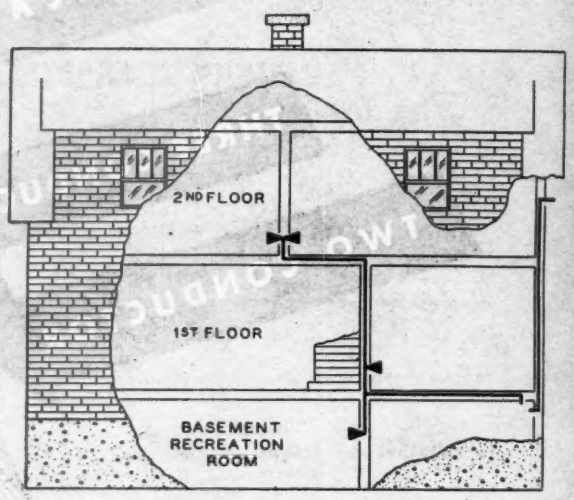
G7

Information For Planning Telephone Outlets

OVERHEAD · SERVICE ENTRANCE

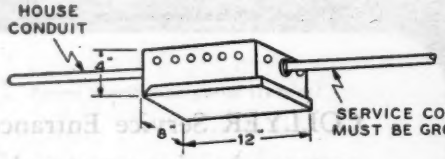


TYPICAL LAYOUT



PROTECTOR CABINETS

INSTALLED WHEN SERVICE TERMINATES IN FINISHED BASEMENT LIVING QUARTERS OR RECREATION ROOM.



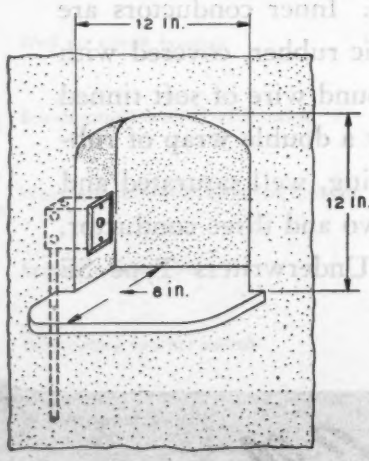
12" DIMENSION MUST BE IN LINE WITH CONDUIT RUNS. 7/8" BACKBOARD REQUIRED IF CABINET IS MOUNTED ON PLASTER BRICK OR CEMENT. ONE PROTECTOR IS REQUIRED FOR EACH TELEPHONE LINE.

THE PROTECTOR SHOULD BE LOCATED AS NEAR THE SERVICE ENTRANCE AS POSSIBLE. IT SHOULD ALSO BE LOCATED SO THAT THE GROUNDING MEDIA APPROVED BY THE NATIONAL ELECTRIC CODE ARE REASONABLY AVAILABLE.

THE PROTECTOR SHOULD BE ACCESSIBLE AT ALL TIMES. LOCKED ROOMS ARE NOT SUITABLE LOCATIONS

TELEPHONE NICHE

(MINIMUM DIMENSIONS)



SIZE OF CONDUIT

PAIR OR TRIPLE WIRE	SIZE OF CONDUIT
1 AND 2	1/2"
3 AND 4	3/4"
5	1"

NOTE: Telephone service requirements vary somewhat in different localities throughout the nation. When planning an installation, consult your local telephone company to verify suggested layout and dimensions.

Information from Illinois Bell Telephone Company

for Jobs Involving Dust, Fumes, and Moisture



WAGNER DRIPPROOF MOTORS are so designed and constructed that drops of liquid or solid particles falling on the motor at any angle not greater than 15 degrees from the vertical cannot enter the motor either directly or by striking and running on a horizontal or inwardly inclined surface.

WAGNER EXPLOSION-PROOF MOTORS have been approved by the Underwriters Laboratories for Class I Group D hazardous locations, "where gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, or natural gas are manufactured, used or handled."

WAGNER TOTALLY-ENCLOSED FAN-COOLED MOTORS are designed to operate under severe and adverse conditions in locations where dust, dirt, abrasives, steel chips, filings, acid fumes, and other harmful elements may damage the windings and bearings.

WAGNER SPLASH-PROOF MOTORS are built to operate dependably in locations where they are subject to splashing water, oil, or other liquids. They are widely used in exposed outdoor locations, and are completely self-protected against ice, sleet, snow, and rain.

WAGNER TOTALLY-ENCLOSED NON-VENTILATED MOTORS may be installed in the locations just described and are built instead of totally-enclosed fan-cooled motors in the smaller ratings because they are less expensive. In the larger ratings they are used where the draft produced by the fan-cooled motor is objectionable.

These motors are protected to do their jobs under severe operating conditions

Do you use motors "in hazardous locations", or perhaps where splashing liquids are present, or where the air contains dust, dirt, acid fumes, etc.? No matter how severe the operating conditions, Wagner has the right motor that is adequately protected against such hazards. Check the advantages gained from using these five types of protected Wagner motors. Then let a Wagner motor authority help you decide which type will solve your motor problem.

Write for Bulletin MU-185 or consult the nearest Wagner Branch . . .

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MAS-16

Wagner Electric Corporation

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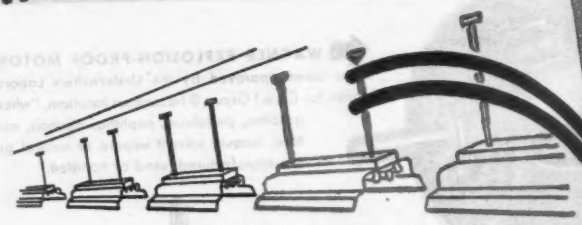
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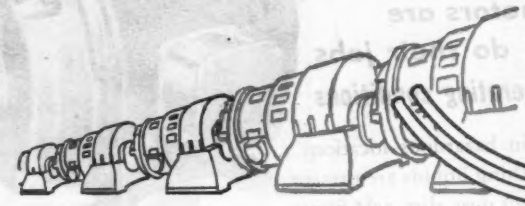
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from existing conduits



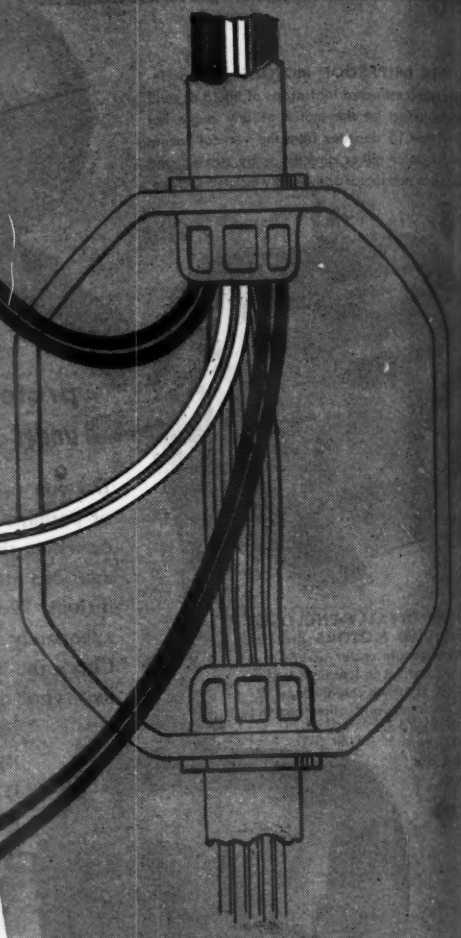
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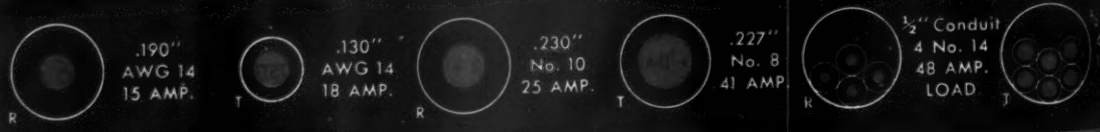
. . . FOR INCREASED OUTPUT



. . . FOR ADDED CIRCUITS



COMPARISON OF TYPICAL DIMENSIONS AND VALUES OF TYPE R AND TYPE T WI



Proper selection of wires should be considered both from a heating and a voltage drop standpoint. Be sure to consult the 1940 N. E. C. and the Roebling catalog for more complete story of what is possible when rewiring (or for the most efficient new wiring).

Rewiring with Roeplastic

Roebling Thermoplastic Thin Wall Wire...for Larger Load Capacity, More Circuits, Reduced Voltage Drop...in *Existing Conduits*

WITH CONDUITS AT FULL CAPACITY, have you been choosing the lesser of two evils... taking the loss from inadequate wiring, rather than the cost of larger conduit installation?

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Roeplastic small diameter wire, replacing ordinary Type R in rewiring, permits use of *more* or *larger* conductors, and a greater area of conduit fill. Not only does the amount of copper pulled through increase, but also the permissible operating temperature. Load capacity increases as high as 300% may be had! The cost of rewiring can well be offset by the savings from increased output.

Add to these advantages the superior properties of the free-stripping, synthetic insulation: high resistance to oil, chemicals, moisture, flame. It has excellent tensile strength, and will pull through conduit easily and without abrasion. Standard colors permit easy circuit coding.

Roeplastic (600 volt—60° C) is furnished in solid conductor, size 14 to 8 A.W.G., and stranded, 14 to 6... type T for dry locations, TW for wet locations. Quantities will shortly be available for non-priority users. Write for details, and our Building Wire Catalog... you'll find it full of helpful wiring tables.

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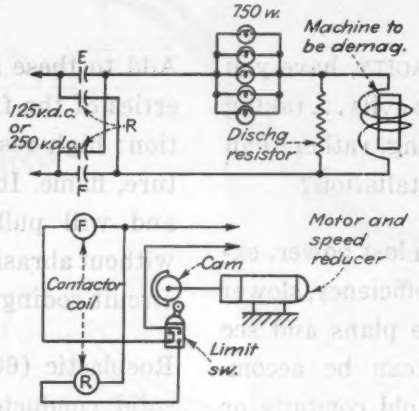
READER'S QUIZ

DEMAGNETIZING A MACHINE

QUESTION 184—We have a vertical milling machine the whole of which is magnetized. We have several voltages including both a-c and d-c available. What is a practical way of demagnetizing the machine?—L.L.B.

A. TO QUESTION 184—A very easy method is to wrap several turns of heavy wire around the magnetized part and apply an alternating current voltage of sufficient magnitude to load the wire to capacity. I am thinking of a wire size that would carry for a very short time several hundred amperes from an a-c welding transformer or similar low voltage source.—E.J.K.

A. TO QUESTION 184—In our mill we have at various times had quite a problem demagnetizing steel tubing. We have found that the following method works out very satisfactorily for demagnetizing entire loads of tube at one time and I would suggest that this idea be used in demagnetizing your vertical milling machine the whole of which is magnetized. The milling machine must first be placed in such a position in the plant that its north and south axis is at right angles to the plant's magnetic field which usually corresponds to the north and south poles of the earth. As many turns of No. 10 wire as possible are wound around the machine on a wooden framework with the axis of the frame corresponding to the north and south axis of the machine. This will form a crude solenoid with the vertical milling machine as an iron core. Across this large coil is placed a high resistance grid, GE Thyrite resistor, or any equivalent field discharge unit. A paralleled set of four or five 750-watt light bulbs is placed in series with the coil to act as a current limiting device. The coil and lamp arrangement is supplied from a reversing type contactor of about 10 to 15 hp. capacity. The voltage applied is either 125 or 250 volt d-c, depending on whatever is available. The voltage used determines the voltage of the bank



of 750-watt current limiting light bulbs. The reversing contactor is alternated between the forward and reverse positions by means of a cam operated limit switch. The cam rotates from a suitable speed reducing device at from 180 to 240 rpm. which is fast enough to give a reversal of current of about 3 to 4 cycles per second. The cam is made up in such a way that for 180° the limit switch is closed and for the last 180° is open. The coil of the reversing contactor is in series with the limit switch and a suitable supply voltage depending on the reversing contactor coil rating.

We have found that if we place the load to be demagnetized in the proper axial relation with respect to the field of the surrounding plant while we are demagnetizing at the low frequency of 3 to 4 cycles per second, we can demagnetize a large load of stubbornly magnetic tube instantly. Steel with a high carbon content is usually quite difficult to demagnetize successfully in a mill with d-c motors on plant machines and cranes, but this method does the trick every time.—M.D.P.

OIL LEAK IN BEARING

QUESTION 185—I have a 7½ horsepower, 3600 rpm. motor that leaks oil out of the front bearing. It has sleeve bearings with an oil ring. I have had new bearings installed but this doesn't seem to help any. How can this trouble be overcome?—R.T.L.

A. TO QUESTION 185—Many oil leaks on high speed ring oiled motors are very difficult to stop. In general, if the oil slinger and the leak-off groove in the bearing are in order, then it becomes a question of equalizing the air pressure in the bearing housing itself.

An easy method that is sometimes successful is to attach two steel ells to the filler cap with one elbow turned down. Another method is to drill holes through the bearing supporting pad, the idea being to maintain an equal air pressure in all parts of the bearing housing rather than have a suction through the bearing bushing itself. If neither of these methods works then all that can be done is to apply a felt seal.—G.R.T.

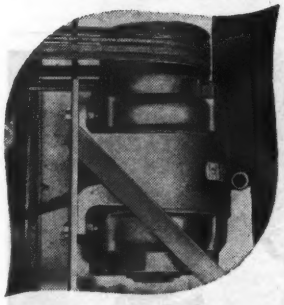
A. TO QUESTION 185—Many times oil leaks out of a sleeve bearing because shaft acts as a pump, making level higher on one side. This is particularly bad if there is no vent in the air chamber above the oil level. We have overcome this condition by drilling ⅛-in. hole in side of bearing housing, hole should be near the top. If oil is leaking from oil cap, it is moved to the opposite side of the bearing housing.—R.M.

A. TO QUESTION 185—This trouble is due to windage of the motor which causes the oil to be drawn from the bearings.

Inspect the bearings and notice if there is an oil groove cut around the inside surface near the end of the bearing which is giving the trouble. If there isn't, then cut one and drill several small holes from the outside bottom of the bearing to the bottom of the groove. This will permit the oil to return to the well. There is another method which has always given good results. This consists of a heavy felt washer cut to fit the shaft snugly and fastened to the journal at the troublesome end with four machine screws which first pass through an iron washer with a hole slightly larger than the shaft diameter



Adaptable to any mounting position



There's no position in which the new Fairbanks-Morse general-purpose motor can't be mounted—and still retain its protective features.

The bearing brackets can be turned to four positions 90° apart, to place the air vents in the desired position.

Bearings are suitable for both vertical and horizontal mounting.

The frame can be reversed to put the conduit box on either side.

This adaptability is just one of many advanced features which make this motor worth your investigation. Ask for a demonstration. Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

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Copperspun Rotor—The *only* rotor centrifugally cast in one piece—and of *copper*.

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C-45	50%	.00015	20-25	Artificial graphite base
D-10	50%	.0001	20-25	Graphitized base stock
D-11	20%	.0004	20-25	Graphitized base stock
E-65	10%	.0008	25-30	Artificial graphite base
E-72	60%	.00003	15-20	Artificial graphite base
E-60	15%	.00065	15-20	Natural graphite base
E-82	15%	.001	65-70	Lamp black graphite base

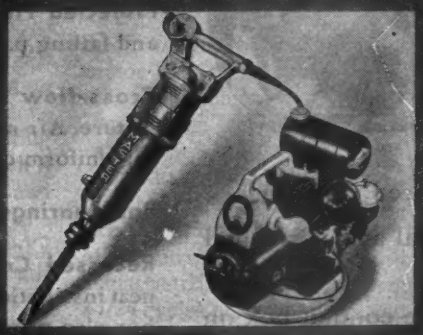
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This washer holds the felt washer in place. Be sure both washers are properly centered.—S.S.P.

A. TO QUESTION 185—One method of stopping oil leaks is by cutting a groove ⅛ in. deep by ¼ in. wide near each end of the bearing shell. Each groove has three holes drilled through the bearing shell to allow the oil collected by the groove to reach the oil well.—H.S.

ADDING LOAD TO TRANSFORMERS

Q *UESTION 186—We have three 100 kva. single phase transformers, 7200 volts primary, and 460 diagonal 230 volts secondary, delta-delta connected into a three phase bank, and at the present time they are carrying an induction motor load of about 150 kva. at 460 volts.*

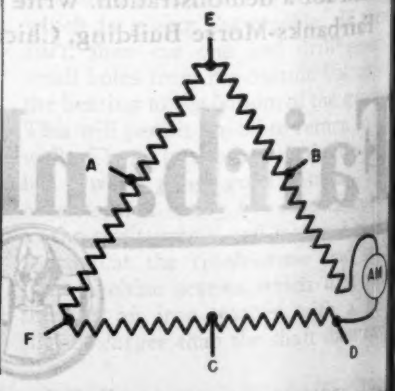
We wish to add more induction motor load to these transformers at 230 volts, as 230 volt auto-starting compensators are the only starting equipment available.

How much additional load in kva. can we add to these transformers without overloading them? How can it be calculated?—L.H.M.

A. TO QUESTION 186—The added 230 volt load may be taken from the mid-points of the transformers, A, B and C on the sketch. Or, it may be taken from either corner of the delta, such as BCD, ACF or ABE. In the former connection, the 230 volt load will be 60 degrees out of phase with the 460 volt load.

With the present condition of the transformers operating at half load, 75 kva. can be drawn from the ABC connection. For this load, the power factors of the two systems must be the same. This is the ideal condition.

The vector sum of the phase (not line) currents of the two systems



should not exceed the current rating of either transformer. This rule can be illustrated from the sketch. If the 230 volt load is taken off at points BCD, coils CD and DB would have to carry the 460 volt load and most of the 230 volt load. By connecting the 230 volt load at ABC, both coils of all transformers would be more evenly loaded —without any appreciable change in total capacity available, the load current of the 230 volt system being more equally divided throughout the delta connection.

An ammeter placed as shown in the sketch would give the combined current readings if the 230 volt load were connected either from ABC or BCD.

A conservative formula for the combined load is

$$\text{Kva load at 230 volts} = \frac{\text{Transf. bank Kva.} - \text{Kva. at 460 volts}}{2}$$

—L.E.B.

A. TO QUESTION 186—To draw both 460 and 230 volt loads from a common delta connected secondary, refer to Fig. 1. The 460

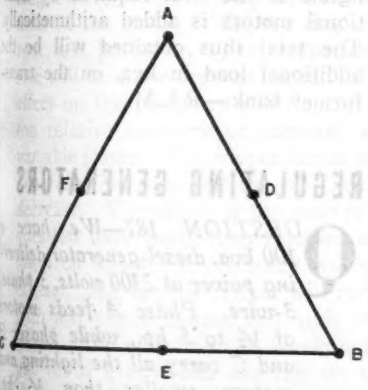


Fig. 1—Secondary connections for dual-voltage transformer. Terminals A-B-C give 460 volts three-phase while D-E-F provide 230 volts three-phase.

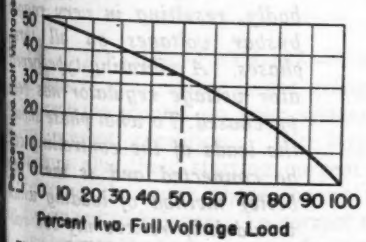
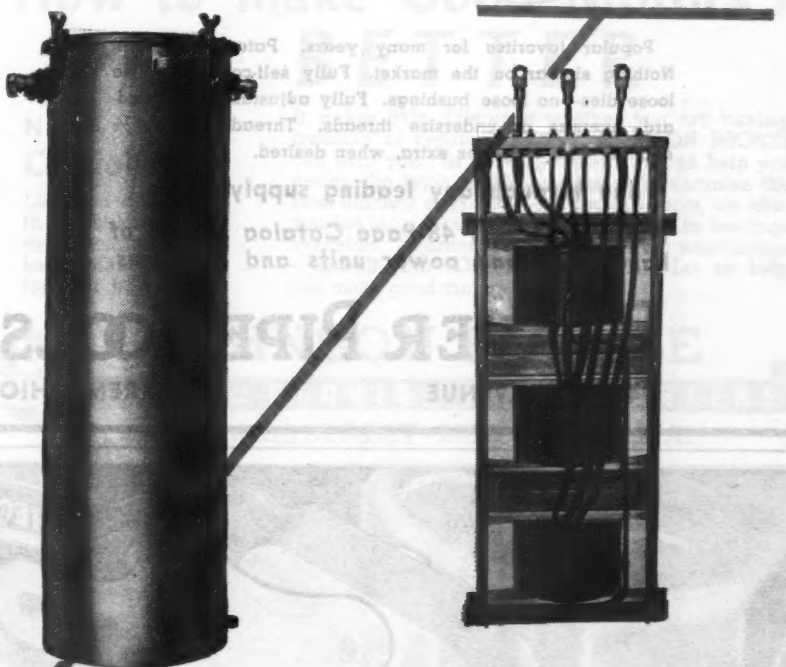


Fig. 2—Load combinations for both full voltage and half voltage loads.

volt load would be taken from points A-B-C. The 230 volt load from D-E-F, Fig. 2 shows the division of loads that can be taken from a transformer bank supplying both full voltage and half voltage three-phase loads. Thus, 150 kva. is 50 percent of the capacity of three 100 kva. transformers. Rising vertically from the 50

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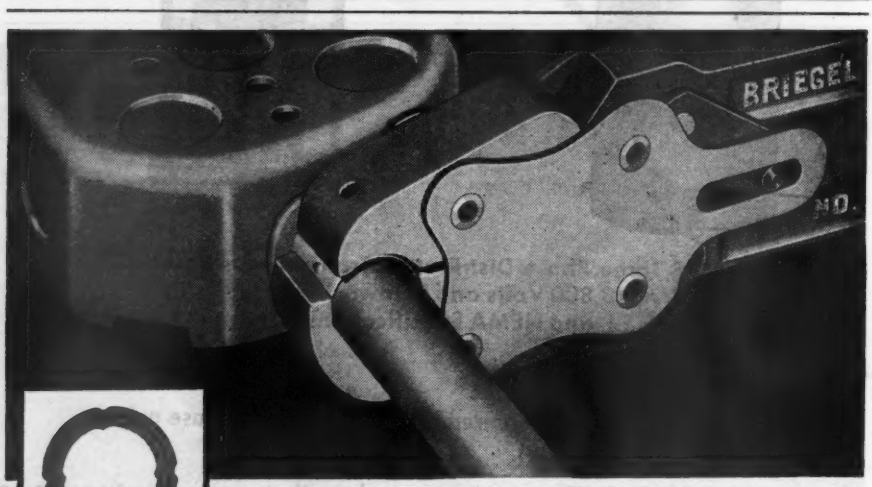
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percent point on the full voltage line to the curve and then projecting across to the half-voltage coordinate shows that about 33 percent kva. may be added. Thus, 33 percent of 300 kva. or 100 kva. at 230 volts may be connected in addition to the 150 kva. at 460 volts.

An alternate connection to supply the 230 volt loads is to connect equal loads to D-A-F, to F-C-E, and to E-B-D. Loads need not be exactly balanced but should be limited to 50 kva. each in this case. This connection with proper balance would allow the full capacity of the transformer to be used by combining 460 volt and 230 volt load,—L.R.B.

A. TO QUESTION 186—Since the existing load on the transformer bank is only 150 kva. and the bank has a capacity of 300 kva., there is 150 kva. capacity to spare, which can be used for the additional load.

Since the entire load is induction motors, it can be assumed that the load power factor is fairly uniform, consequently the calculations will be very simple. The error will be negligible if the kva. required by additional motors is added arithmetically. The total thus obtained will be the additional load in kva. on the transformer bank.—R.L.M.

REGULATING GENERATORS

QUESTION 187—We have a 100 kva. diesel-generator delivering power at 2300 volts, 3 phase, 3-wire. Phase A feeds motors of ½ to 5 hp., while phases B and C carry all the lighting and motors smaller than ½ hp. Average phase loads are approximately balanced, but frequent starting of motors on phase A causes the generator to regulate badly, resulting in very ragged busbar voltages on all three phases. A vibrating-type generator voltage regulator has been purchased. To what phase should the leads of the controlling coil be connected and is there any better method of loading which would help relieve my bad voltage conditions?—E.O.L.

A. TO QUESTION 187—While the speed of a squirrel cage induction motor is determined mainly by the frequency of the supply and the number of its poles, it is to a much lesser extent affected by the supply voltage. The slip varies inversely as the square of the voltage. The amount of the change in speed depends on the amount of normal slip at the particu

lar load. In this case, the increased full load slip will be equal to $(220/208)^2 = 1.12$ times the normal slip at rated voltage and full load. A substitution in the expression for slip in terms of synchronous and full load speeds will indicate that the percentage decrease in full load speed is on the order of 0.6 percent.

As a result of this reduced speed, the input to the fan will be decreased in proportion to the cube of the speed, neglecting the effects of power factor and efficiency. However, the input current will be increased about 5 percent as a result of the reduced voltage. The net effect will be a rise in line current of a few percent which will not to be injurious to the windings of the motors.

The starting and running torques will be decreased by the ratio of the squares of the voltages. The new torques will be $(208/220)^2 = .89.3$ percent of the torques at normal voltage.

It may be of interest to note that on undervoltage and at full load, the power factor will be higher depending on the extent of the saturation of the cores and the relation between the magnetizing current and leakage reactance of the motor. The starting current will be lower. The temperature rise will be a few degrees higher. The effect on the efficiency will depend on the relative amounts of constant and variable losses. The copper losses will generally increase and the iron losses decrease. Therefore, if the motors in question have high copper losses and low iron losses, the efficiency will decrease. The opposite effect will result with low copper losses and high iron losses. The effect on the kilowatt input for a given load depends on the change in efficiency. Furthermore, the overload capacity of the motors will be about 10 percent lower and the magnetic noises slightly reduced.—R.G.C.

A. TO QUESTION 187—A voltage regulator is not going to correct the trouble on your system in its present condition. The largest motors plus their starting current all being on the same phase throws the system out of balance. To correct this and balance the system properly, it will be necessary to reconnect the circuits as follows. Put an equal number or as near as possible an equal number of motors of the same hp. rating on each phase. Then put an equal number of lighting circuits on each phase. If some lighting circuits are loaded heavier than others, distribute the ones that are loaded heaviest equally among the three phases. In this way, the load will be fairly evenly distributed among

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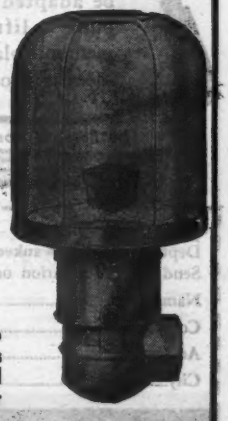
DON'T GAMBLE with HAND OILING

It's a "trust-to-luck" method—too much oil . . or too little—IT'S ALL GUESSWORK!

INSTALL TRICO OILERS FOR . . . .

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- Increased output
- Longer bearing life
- Lower maintenance costs
- Saving of time, oil, worry
- Less fire and accident hazards

Modernize all equipment and you will always look with pride to every TRICO OILER installation you make. Hundreds of thousands are already in service giving definite economies in operation and maintenance. There's a style for every application. Write for catalog.

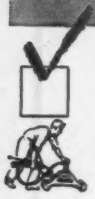


Optomatic Constant-Level Oiler

TRICO FUSE MFG. CO., Milwaukee 12, Wis.
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INSTALL TRICO OILERS

When You Buy a
BENDER
. . . Check to Make Sure You Get These Features



EASY TO GET TO THE JOB
Lightweight and portable, one man can easily carry or roll any Blackhawk Pipe Bender right to the job. Saves time and manpower. Bend rigid conduit and pipe up to 4".



WORK AT ALL ANGLES
Compact hydraulic Porto-Power ram of Blackhawk Pipe Bender works in all directions. Unique design. Avoids kinking. Power eliminates need for heating.



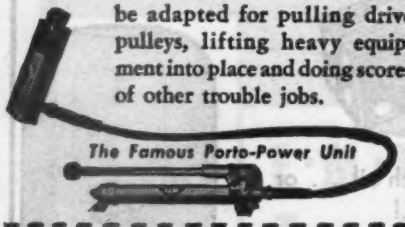
WORK OVERHEAD
All-directional operation and light weight permits work on existing pipe runs.



SIGHT FROM ANY ANGLE
Remote control permits operator to stand in any position necessary to give him full view of job. Blackhawk Benders save need for elbows and couplings and otherwise necessary cutting and threading.



DETACHABLE POWER UNIT *for Extra Utility*
This unit (the heart of the bender) with special available Porto-Power attachments, can be adapted for pulling drive pulleys, lifting heavy equipment into place and doing scores of other trouble jobs.



BLACKHAWK MFG. COMPANY
Dept. P2095, Milwaukee, Wis.
Send full information on your pipe benders.
Name.....
Company.....
Address.....
City..... State.....

BLACKHAWK
Porto-Power
PIPE BENDERS

all three phases and a voltage regulator should not be necessary. However, it is sometimes necessary afterward to shift a circuit here and there to make it balance out about even, especially if some motors on the system operate more than others.

I have corrected quite a few conditions of this kind in this manner in the past and in each case it has proven entirely satisfactory.—C.R.H.

A. TO QUESTION 187—The fact that your 100 kva. alternator regulates badly is indicative of an unbalanced condition which is undoubtedly due to your method of loading. If it is at all possible, the different types of load which you mention such as, ½ to 5 hp. motors, less than ½ hp. motors, and lighting, should be equally distributed among the three phases. While the phase loads are approximately equally balanced, it is the type of load that counts. Your vibrating type of voltage regulator can be connected to any phase. Its operation will tend to raise or lower the voltage of all phases.—W.B.M.

CONNECTING TRANSFORMERS

Q *UESTION 188—Being unable to obtain a 440/110 volt transformer for a small single phase load, we bought two 0.250 kva., 220/110 volt single phase units. The primaries were wired in series and connected to 440 volt supply. The secondary of one transformer is used to operate a small 110-volt wheel dressing motor. The other is used to run a small fan. This arrangement works satisfactorily when both motors are used, but when the fan is shut off, the wheel dressing motor loses speed and torque. What causes this and how can it be remedied?—J.J.L.*

A. TO QUESTION 188—This setup using two 220 volt transformers with primaries in series would have worked perfectly had both secondaries been paralleled, observing correct polarity. An idle transformer represents a high resistance, this resistance effect decreases as load is applied. With rated load on one transformer, and no load on the other, the primary voltage of the idle transformer was considerably higher than that of the loaded one.

With equal load on each secondary, the primaries both draw rated current. With the secondaries in parallel, each

TRIPLOC
plugs and receptacles



1; 2, 3, 4, 6, 8 pole interchangeable contact units

Interchangeable contact units, 1 to 8 poles, can be assembled in standard plug shells and receptacle housings to make any desired unit to meet individual requirements for any portable electrical equipment. The protected female contact unit can be assembled in either plug or receptacle for safety in the line side of the circuit. Fusible types and units with one pole grounded are also available.

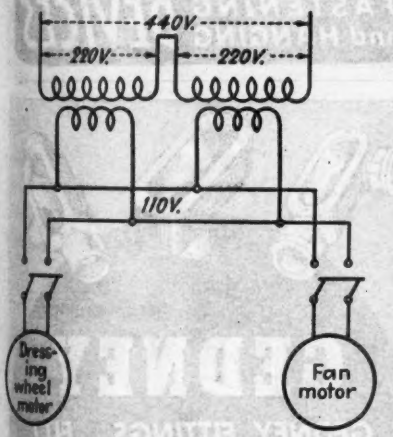
Automatic bayonet lock with either manual or combination manual and automatic release protects equipment and wiring. Wide range of plug shells, receptacles and cord connectors available in the complete Triploc line, ratings up to 20 amperes, 250 volts D.C., 460 A.C. Consult your Pylet catalog for complete listings.

THE PYLE-NATIONAL COMPANY
1344 N. Kostner Avenue, Chicago 51, Illinois

draws equal current, and consequently primary currents are equal, and voltage across the primaries would be equal.—W.B.P.

A TO QUESTION 188—Since the primary windings of the two 25 kva., 220/110 volt transformers are connected in series across the 440 volt supply, it is evident that at any time the value of current flowing in the primary winding of one transformer must be the same in the primary winding of the other transformer. So long as the secondary windings of both transformers carry approximately equal motor loads, the performance of the motors will be normal.

When one motor is shut off the secondary winding of its transformer becomes open circuited and the impedance of that transformer rises to its open circuit value. The current in the primary circuit is equal to Circuit Voltage/Circuit Impedance. The circuit voltage is constant; therefore, an increase of circuit impedance produces a decrease in the current and the loaded transformer cannot then draw sufficient current from the source to carry its load.



Assuming the two transformers to be of the same make and type (or of equal impedance and the same polarity) a satisfactory connection is shown by the sketch.—H.A.W.

A TO QUESTION 188—When the secondary of one of the transformers is opened (by shutting off the motor it supplies) the primary presents a large impedance and prevents the flow of enough current through the primary of the other transformer to allow it to carry its load.

The trouble can be corrected by connecting the two secondaries—properly poled-in parallel.—J.L.

A TO QUESTION 188—In the scheme used by J.J.L., both primaries are connected in series, and

ELECTRICITY
For Any Job—Anywhere

Reliable, economical electric service for electrical contracting projects anywhere, anytime, with an Onan Electric Generating Plant. From the 65 basic models, the right plant for any job or application, large or small, can be selected.

Driven by Onan built, 4-cycle gasoline engines, these power plants are of single-unit, compact design and sturdy construction. Suitable for all mobile, stationary or emergency service.

Model shown is from W2C series, 2 and 3-KW, 60-cycle, 115 volt; powered by water-cooled, 2-cylinder engine.



ELECTRIC PLANTS
Onan

Models range from 350 to 35,000 watts. A. C. types from 115 to 660 volts; 50, 60, 180 cycles, single or 3-phase; 400, 500, and 800 cycle, single phase; also special frequencies. D. C. types range from 6 to 4000 volts. Dual voltage types, available. Write for engineering assistance or detailed literature.

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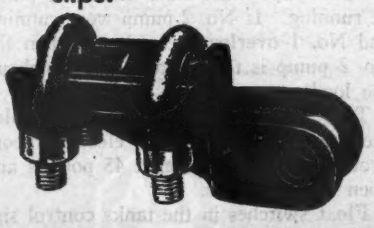
"EFFICIENCY" DEVICES FOR CONDUIT AND CABLE SUSPENSION



Clamps available in three sizes for Cable diameters of 1/10 to 1,500,000 cm.

EFFICIENCY CABLE STRAIN-CLAMP

. . . Stands *Direct Pull* of over 17,000 lbs. before cable slips!



By actual test, the EFFICIENCY Cable Strain Clamp will withstand a direct pull of over 17,000 pounds without permitting the cable to slip. This powerful grip results from the EFFICIENCY Clamp's "H" design, incorporating a high ridge across the center of the cable channel and a U-bolt at each end.

Adaptability to all requirements is provided in the EFFICIENCY Clamp's alternate construction . . . which may be clevis or eye, according to your requirements. Both styles are furnished for A.C. or D.C. service.

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Efficiency ELECTRIC AND MANUFACTURING CO.

both secondaries are independently connected to individual loads. If these loads are equal, both transformers equally share the total load. However, if only one transformer is loaded, the other acts as a series reactor, and will take the major part of the line voltage, say 330 volts. As a consequence, the loaded transformer will receive only a fraction (in this case: one half) of its rated primary voltage, with a concurrent decrease in speed and torque of the connected load.

The situation is easily remedied by connecting the two secondaries in parallel (watch polarity). Whatever load is then applied, it is equally shared by both transformers, and no unequal voltage division is possible.—L.F.R.

Can you ANSWER these QUESTIONS

QUESTION N8—We have a group of 3 hp. squirrel cage induction motors, 220 volts, 60 cycles, 3 phase. These motors drive separate conveyors; these conveyors cannot be stopped when they are reversed. We have a motor operated timer that controls each of the motor reversing starters. These motors operate from forward to reverse; in other words, we plug these motors.

I would like to know if it is possible to protect these motors with the proper size overload relays. We depend on fuses.—R.E.P.

QUESTION P8—We have three water pumps, each one has its own contactor, one of which is to run at a time.

The starting and stopping of these pumps is controlled by one pressure switch. The motor is three phase. Coils 220 volts.

Should the No. 1 pump kick out its overload relay, we want the No. 2 pump to start, and should No. 2 trip, then No. 3 is to start.

Whichever pump happens to be running must be stopped if the pressure switch opens.

At no time must more than one pump be running. If No. 2 pump were running and No. 1 overload relay reset, then the No. 2 pump is to stop and No. 1 pick up the load.

The pressure switch is controlled mechanically and has no electrical connection except to close at 45 pounds and open at 80 pounds.

Float switches in the tanks control signals only and at present do not affect the pump contactors or motors.—C.A.S.

PLEASE SEND IN YOUR ANSWERS BY OCTOBER 1



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NON-HEATING CONTACTS

Keep Motors Humming



100% Quality

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Ask your Supplier or Write for Prices

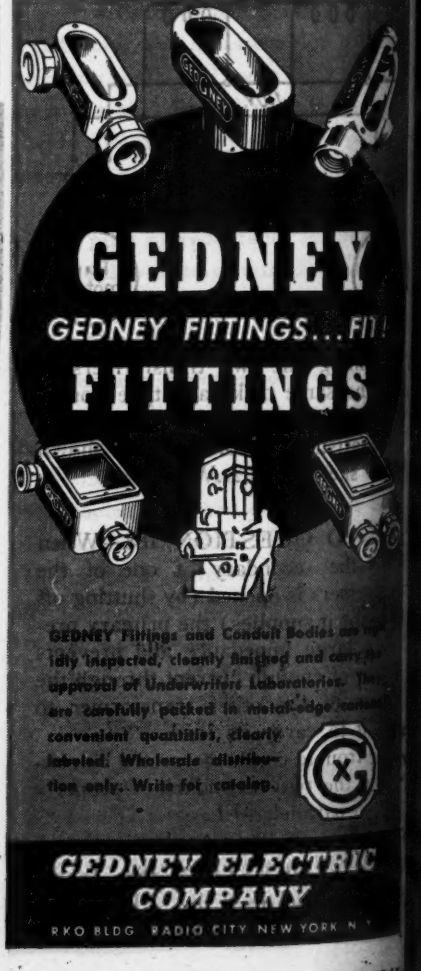
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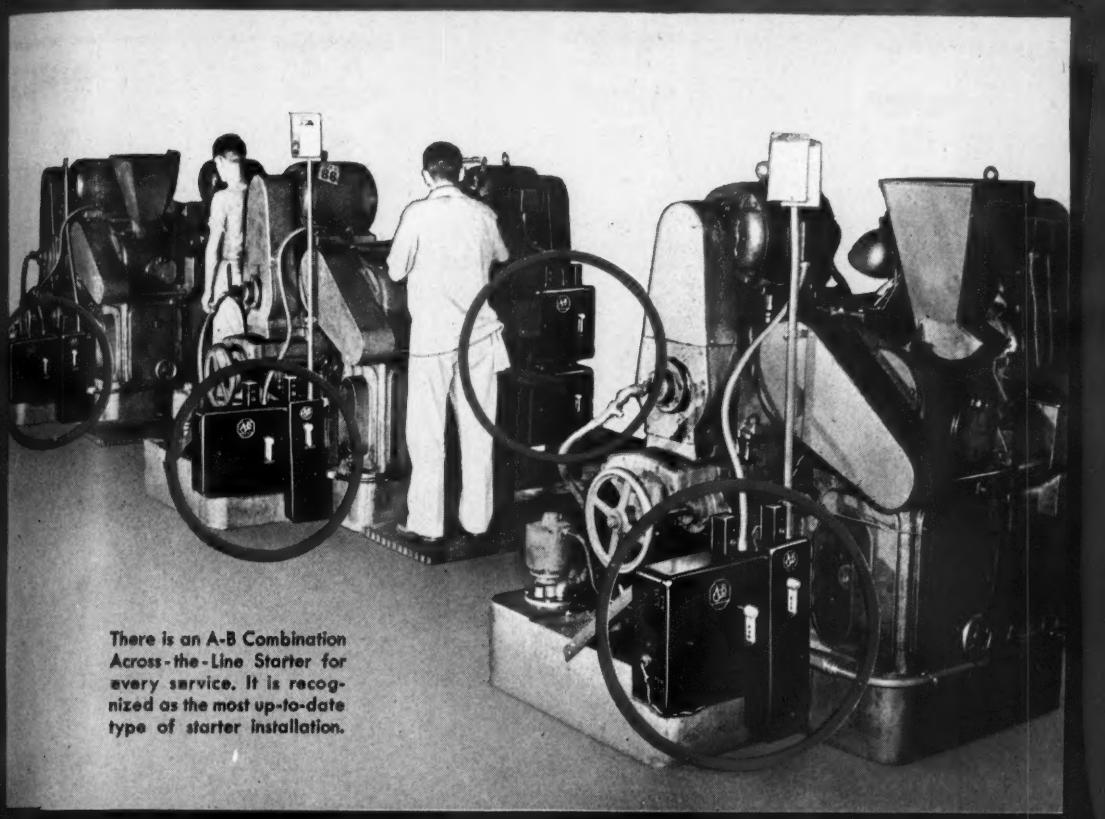
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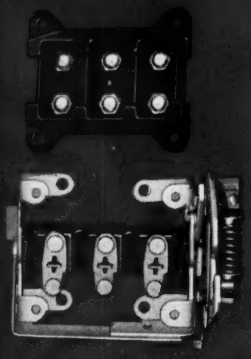
FASTENING and HANGING DEVICES



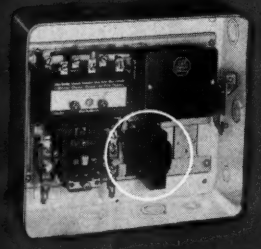


There is an A-B Combination Across-the-Line Starter for every service. It is recognized as the most up-to-date type of starter installation.

Reduce
YOUR INSTALLATION AND MAINTENANCE COSTS with A-B Combination Starters



A-B Disconnect Switches have double break, silver alloy contacts. All knife switch troubles are eliminated.



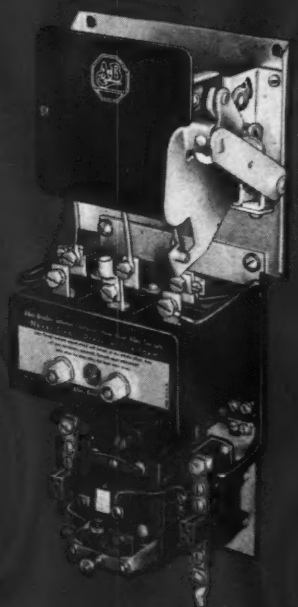
Can be supplied with step-down transformers for low voltage pilot control on 440, 550, and 600 v power lines.

The big wartime plants were quick to discover the many operating advantages of Allen-Bradley Combination Starters. Row after row, the machine tools in war plants are equipped with Bulletin 712 Combination Automatic Across-the-Line Starters. To "kill" a machine, the handy disconnect lever is moved to "OFF" position . . . and padlocked if necessary. Safety to man, motor, and machine is assured.

For reconversion to peacetime production, Bulletin 712 Combination Starters offer the same worth-while advantages. They are fully described in Bulletin 712-713. Allen-Bradley Combination Starters save space, speed up wiring, reduce installation costs, provide added safety, and make a trim, neat control installation.

There are seven types of enclosures that satisfy every service condition. Overload relays give dependable motor protection.

Close-up of A-B Bulletin 712 Combination Starter. Disconnect unit is mechanically interlocked with disconnect lever so cabinet cannot be opened unless disconnect switch is in the "OFF" position.



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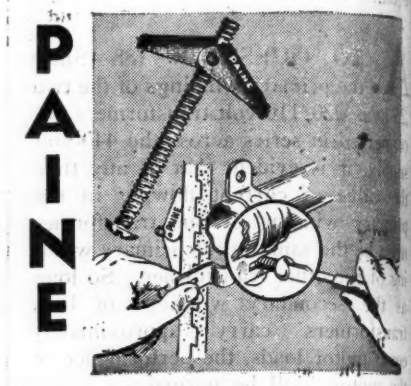
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For Hollow Walls



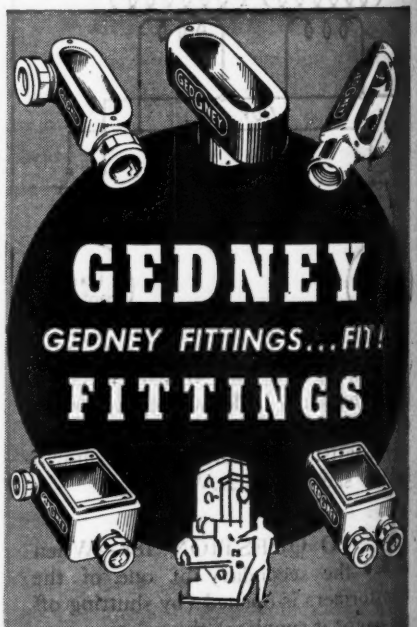
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Assure strong, permanent anchorage in hollow material. Easily and quickly installed, they will not pull out or work loose. Available in several head styles in standard bolt diams. from ⅛" to ½" in standard lengths.

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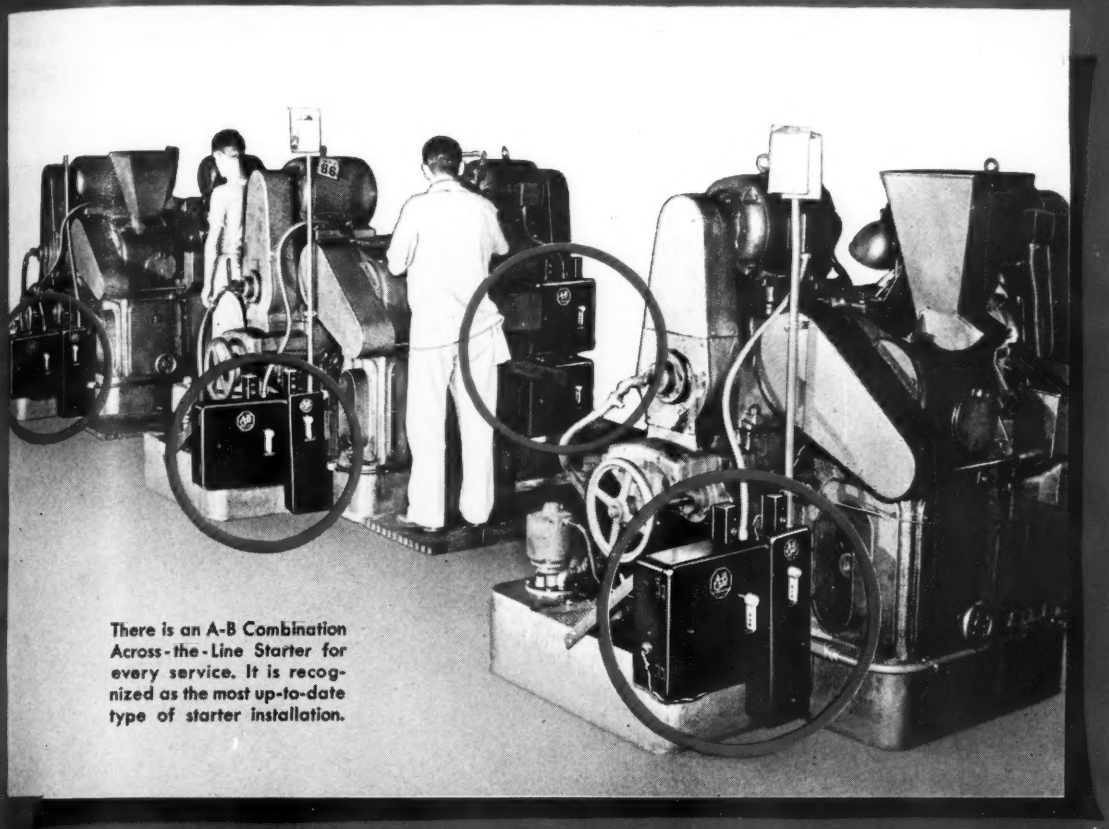
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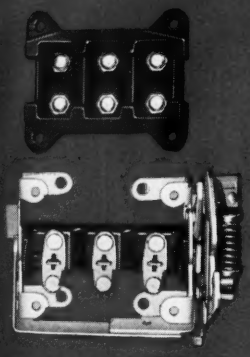
GEDNEY ELECTRIC COMPANY
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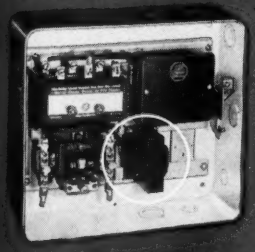
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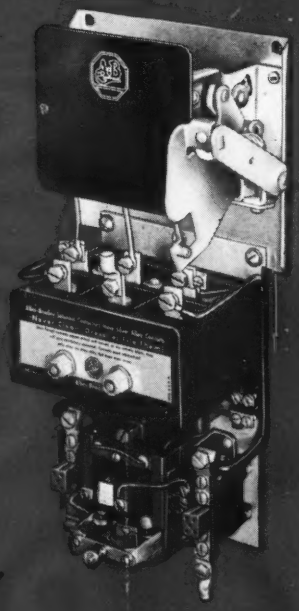
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There are seven types of enclosures that satisfy every service condition. Overload relays give dependable motor protection.

Close-up of A-B Bulletin 712 Combination Starter. Disconnect unit is mechanically interlocked with disconnect lever so cabinet cannot be opened unless disconnect switch is in the "OFF" position.

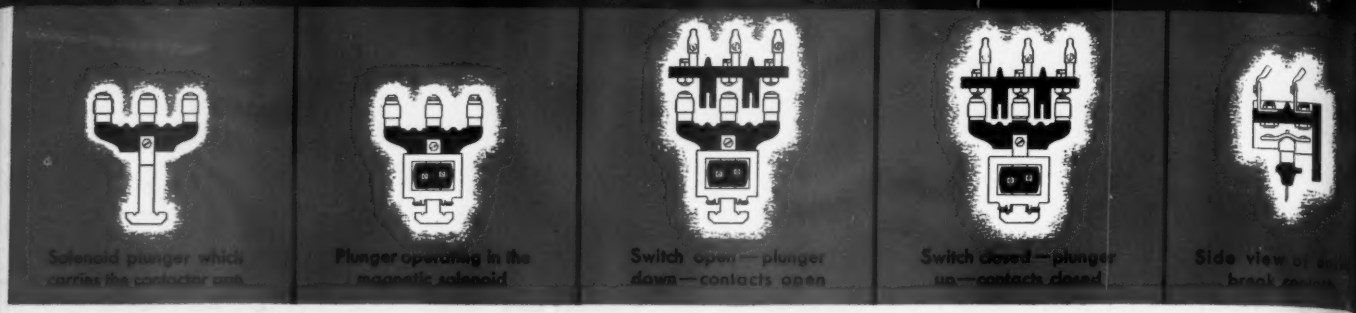


A-B Quality

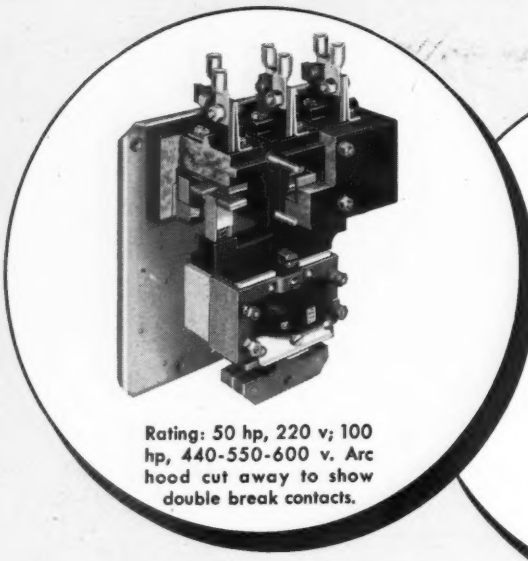
ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

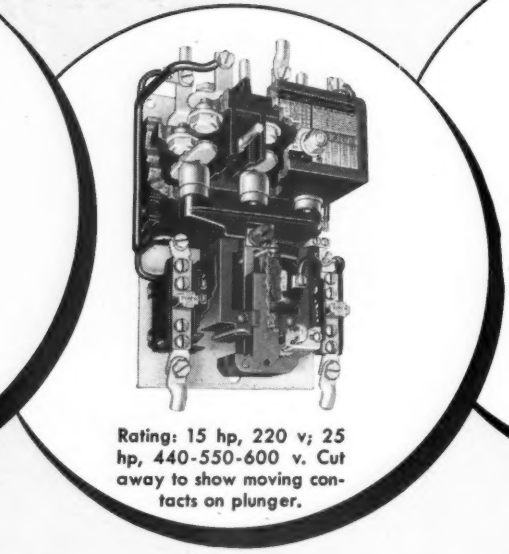
QUALITY



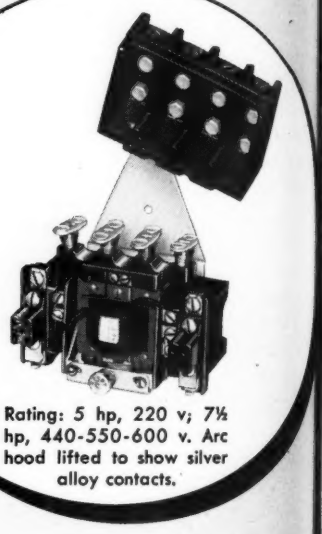
ONLY ONE MOVING PART
in ALL Allen-Bradley Solenoid Starters



Rating: 50 hp, 220 v; 100 hp, 440-550-600 v. Arc hood cut away to show double break contacts.



Rating: 15 hp, 220 v; 25 hp, 440-550-600 v. Cut away to show moving contacts on plunger.



Rating: 5 hp, 220 v; 7½ hp, 440-550-600 v. Arc hood lifted to show silver alloy contacts.

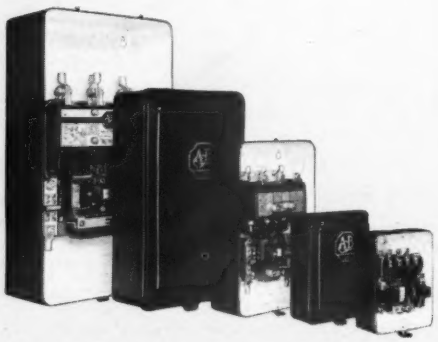
SIMPLICITY—The Keynote to Trouble-free Design

It is a fundamental fact that when you eliminate "parts" you eliminate "trouble"... when you do away with pivots, pins, bearings, flexible jumpers, and other gadgets in starters you do away with trouble-breeders.

Since the A-B solenoid starter has only ONE moving part . . . the one-piece solenoid plunger . . . it is the simplest starter on the market and therefore the most trouble-free.

Furthermore, the double break, silver alloy contacts never need filing, cleaning, or dressing. You can install an Allen-Bradley solenoid starter . . . and forget it.

Is it any wonder that A-B solenoid starters have set the standard for starter design and performance? Ask the machine tool manufacturers... more and more machine tools are A-B equipped. If you want trouble-free operation . . . just specify A-B.



Allen-Bradley solenoid across-the-line starters are available in five sizes and seven types of enclosures to meet all service requirements. White cabinet interiors make wiring easy in dark corners.

Allen-Bradley Company
1316 South Second Street
Milwaukee 4, Wisconsin

A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

The Theatre Lighting Market

[FROM PAGE 77]

prise, besides provisions for motion picture projection and television as the principal attractions, kindred forms of entertainment, including bowling, billiards, skating, dancing and other participation sports and pastimes.

The motion picture theatre thus will assume, as indeed it has tended to serve in the past, first rank in importance as the keystone element of the community center plan proposed in the broad scheme for better living. The standard of public service already established by the modern motion picture theatre operation will be extended to other enterprises.

These modern theatres and multiple-enterprise projects of the early postwar period—those already planned and yet to be built, as well as many hundreds of existing houses to be remodeled and modernized by "face-lifting" and other forms of structural alteration—will require the latest and best of lighting effects and fixtures.

Lighting equipment manufacturers, engineers, contractors and dealers, including power companies and all others concerned with progress in lighting practice may, we believe, cultivate and encourage the pivotal theatre market as a means of re-establishing public interest in and resumption of demand for lighting products, which have been subject to a high priority rating, and therefore severely curtailed for civilian use throughout the war.

One of the peculiarities of the motion picture showman, whether he is a large circuit operator or a small independent, is his keen personal interest in whatever he buys for his place of business. Yet, this personal interest centers entirely on how profitably the purchase will react to his benefit at the box-office. His business is to please the public, something he can hardly do with good pictures alone. Efficient lighting for advertising display, decorative effect and general illumination is comparable in importance, though much lower in original cost and upkeep, to comfortable theatre seating. Both are major essentials to house appeal; yet the record shows that a pitifully small number of our present theatres is properly and adequately equipped to exemplify the much-advertised functions of better lighting.

This point, plus the important public interest angle heretofore expressed, presents a serious challenge to greater sales effort on the part of the lighting industries, many branches of which have vital interests at stake in our theatres of tomorrow.



Heavy duty receptacle and plug

EVER-LOK
Receptacles, Connectors *and* Plugs

AUTOMATIC LOCKING

Ten (10) reasons why Ever-Loks are Standard Equipment in leading Industrial Plants where uninterrupted service is vital. →

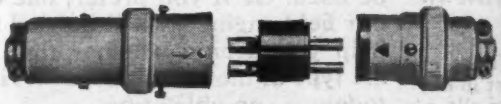
1. Automatic locking
2. Positive grounding
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4. Metal clad
5. Full contact protection
6. Adjustable cord grip
7. Self-wiping, self-aligning contacts
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9. Unit Assembly easy wiring
10. Fusible or non-fusible

Ever-Lok protects against every contingency including abuse and frequent and hard usage.

For light and power circuits, 2, 3 and 4 poles, 10 to 200 Amperes.

For public address and control circuits 2 to 12 poles, 250 Volts.

Complete Catalog on Request.



New Ever-Lok Connector with midget fuses for high cycle tools and small portable equipment.



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RUSSELL & STOLL COMPANY

EXPLOSION-PROOF, WATER-TIGHT, INDUSTRIAL LIGHTING FIXTURES AND EQUIPMENT. AUTOMATIC LOCKING "EVER-LOK" CONNECTORS

125 BARCLAY STREET · NEW YORK 7, N. Y.

We need four hands

TO POINT OUT THE MAJOR FEATURES OF THIS MOTOR



But *you* need only one head . . . and two minutes . . . to appreciate these design advantages of the *new* Crocker-Wheeler Protected-Type Motor.

1. Frame and shields have no openings above the horizontal center line, which means that dripping liquids, falling metal chips, etc., can't get inside the motor to damage the interior working parts.

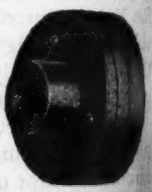
2. *Vinylastic* insulation makes coils dirt, oil and moisture resistant to a high degree. Phase insulation provides added protection. Treatment in thermo-setting varnish lengthens insulation life and prevents destructive vibration of coils.

3. Bars, fans and end rings of *Alucast* rotor are die cast in one operation from aluminum alloys, forming a practically indestructible rotor. All rotors are dynamically balanced to assure smooth, vibrationless operation.

4. Patented bearing seal for ball bearings (sleeve bearings are optional) is so effective that regreasing is required only once a year or even less frequently, hence maintenance expense is negligible. This seal permits use of softer grease, for better lubrication and longer bearing life.

Write on your company letterhead for a FREE copy of descriptive bulletin DL-121, which tells where these motors should be used. Or if you prefer, one of our field engineers will be glad to help you decide whether this is the type of motor you need. Write today . . . no obligation.

THESE COUPLINGS HAVE UNIQUE FEATURES, TOO!



The Crocker-Wheeler resilient flexible coupling consists of a spider, a flange, a ball retaining cover and six synthetic rubber balls—that's all there is to it! And yet, this is more than just a trouble-free coupling—it actually adds years to the life of both the driving and driven machines.

The balls transmit torque, absorb shock and vibration, yet do not transmit end thrust. Available for shaft diameters up to 8", these couplings require no lubrication, no maintenance of any kind. Write for complete information.

CW-4

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A DIVISION OF JOSHUA HENDY IRON WORKS, AMPERE 7, NEW JERSEY

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SQUIRREL CAGE MOTORS WOUND ROTOR MOTORS DIRECT CURRENT MOTORS GENERATORS FLEXIBLE COUPLINGS

MOTOR SHOPS

SAND BLASTING SPEEDS PARTS CLEANING

You really can't appreciate one until you use it, commented V. A. Pinkerton, superintendent of the motor repair department, Fred W. Kiemle Co., Toledo, Ohio, as he surveyed the Mott sand blast unit in the shop and substantiated that familiar slogan "Ask the man who owns one."

It was somewhat difficult to sell the shop personnel on this new "contraption" at first. Then they discovered that they could save about two hours time cleaning a standard set of brush holders for a 15 hp. d-c motor (now takes only 15 to 20 minutes). No longer do they have to struggle through that rather messy nitric acid cleaning procedure where all metal parts that might be damaged by the acid must first be removed, cleaned separately, then replaced. But that's not the limit of its usefulness. Shop men have grown so fond of the unit that they use it to clean practically everything—even small stators. Take it away now and there would be a resounding howl of protest.

The sand blast unit consists of a sizable metal enclosure with a large hinged front door (to insert and remove large pieces of equipment) equipped with two circular hand-holes fitted with heavy rubber sleeves. Lights inside the enclosure and a large, unbreakable, plate glass viewing window above the door permit the operator to see the work being cleaned. The double hose nozzle (one for air and one for sand) can be moved about to direct the blast of finely granulated sand under comparatively high pressure on different parts of the work.

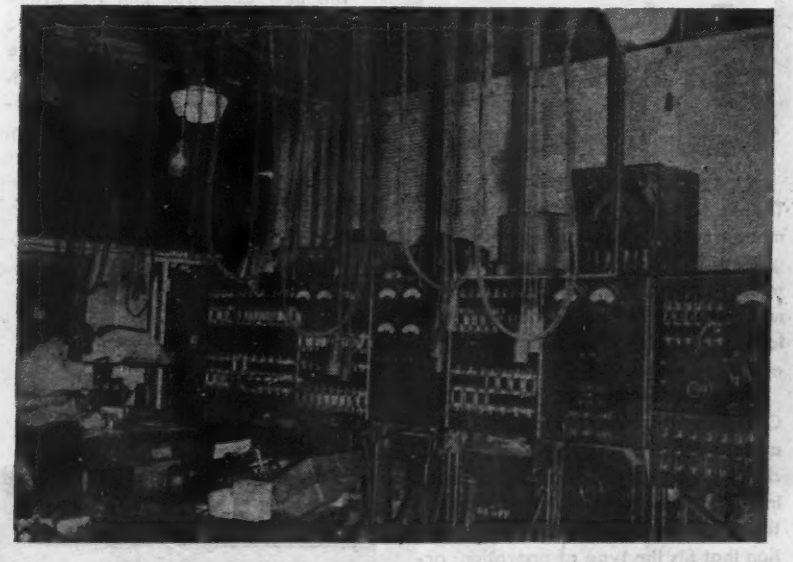
When cleaning equipment, the operator wears a pair of rubber gloves to protect his hands from the sand spray. After placing the equipment in the booth, he latches the door and places his hands through the handholes. The work is held in the left hand while the right directs the nozzle spray.



Sand blast unit speeds up cleaning of metal parts in the motor repair shop of the Fred W. Kiemle Co., Toledo, Ohio. Time can be cut 75 percent on small parts (brush holders, etc.). Unit is even used to clean small stators. Larger ones go to the degreaser.

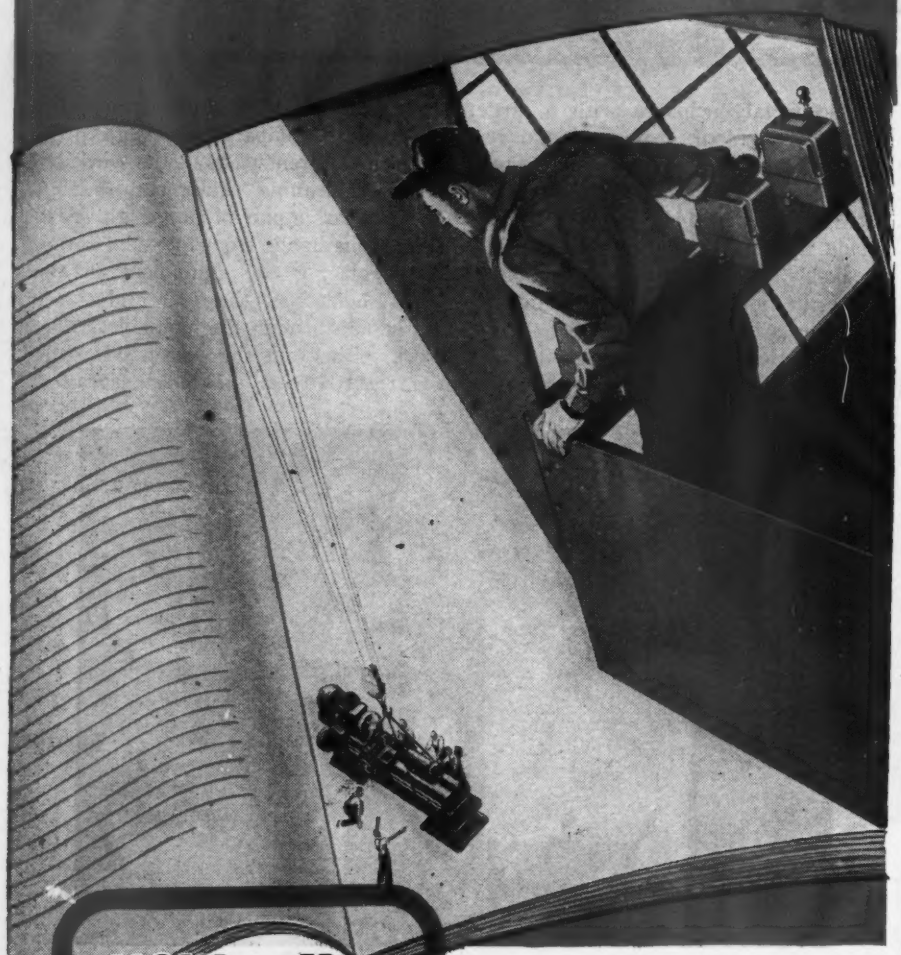


Interior of unit showing the turbine nozzle fed by an air and sand hose. Nozzle is grounded to frame to discharge static built up by the nozzle turbine. Interior lights and viewing window permit operator to see work during cleaning process.



Counter-weighted test leads are kept up and out of the way in the motor repair shop of the Fred W. Kiemle Co., Toledo, Ohio. Conduit extensions, terminating at the ceiling in front of the test board, feed the leads. Ropes, fastened to a loop in each group of test leads, pass over pulleys to counter-weights at the other side of the room. Each set of leads is equipped with spring clips protected by rubber jackets.

A New Chapter in CRANE PERFORMANCE.

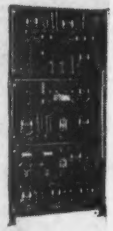


NOW... You Can Get DC Performance on AC Cranes

Thanks to Cutler-Hammer engineers, modern cranes are operating on AC and getting DC performance. No longer must factories install expensive equipment for generating direct current. No longer must these plants install cranes equipped with mechanical load brakes.

With the new Cutler-Hammer AC Crane Control, complete load-control is at your finger-tips at all times.... Five definite and selective speeds of hoisting and lowering; full dynamic braking; timed load acceleration and deceleration that fits the type of operation; accurate jogging that safely places even the most unwieldy load "on spot"... all with alternating current that responds to the touch at the C-H Master Control Switch.

This new Cutler-Hammer AC Crane Control can be used with any standard slip ring crane motor and is available in manual drum type and magnetic types. Insist on this unique engineering development for your next crane installation. Write or wire TODAY for full information. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ont.



Engineering Excellence finds its Greatest Reward in the Respect and Confidence of those it Serves

CUTLER-HAMMER
MOTOR CONTROL
C-H

One refinement the Kiemle shop has made on the unit is the grounding of the sand blast nozzle. It seems that the small built-in, air-operated turbine in the nozzle set up a static charge which frequently gave the operator somewhat of a "kick." A length of bare, braided, flexible, copper bonding conductor fastened to the metal nozzle and the frame of the unit now discharges the built-up static and former complaints have been eliminated.

All things considered, the unit—through the perfect cleaning job it does and the vast amount of time it saves—has paid for itself many times over and should be standard equipment in every repair shop, according to Pinkerton.

EFFICIENT COIL SPREADER

Adams Electric & Motor Service, Los Angeles, has built a coil spreader that is plenty fast for the ordinary motor repair shop where a large number of coils do not have to be put through at the same time on a production line basis. It consists of a welded steel frame with table top on which is a fixed frame at one end, with a pair of slots for grasping one side of the coil. A carriage, sliding on steel strip guides is provided with a similar pair of slots for taking the other side of the coil. The slotted members on both fixed frame and carriage are adjustable as to distance apart, to correspond with the dimensions of the coil sides.



SLIDING CARRIAGE facilitates spreading coils easily and quickly.

The carriage is drawn away from the fixed frame by means of a foot lever to which a chain is attached, running over a pulley and the other end being attached to the carriage. This stretches the coil to the proper opening.

PORTABLE STATOR VISE

The old adage that "a mechanic is only as good as the tools he uses" has been taken seriously by George Holman, Marissa, Illinois. Recognizing that the winding of small motor stators is very often a tedious job, he has found that it may be made easier by locking the stator in a vise which will permit the stator to be turned about easily.

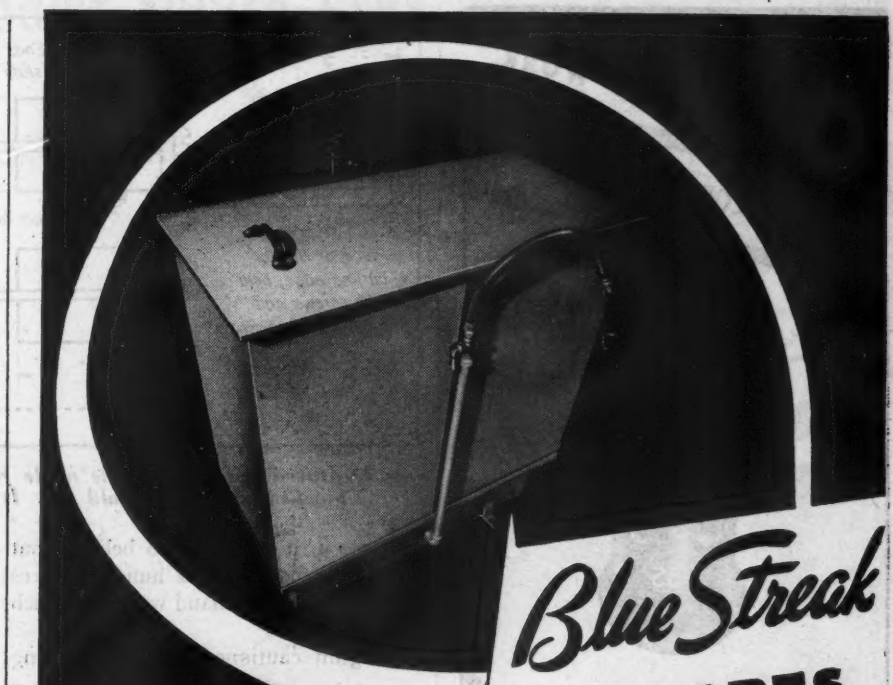
The base of this vise is of sheet metal, with the vise pivot in the center. The locking screw has an extension to which a small valve wheel is fixed. By a slight turn of this wheel, the pivot is unlocked, and vise and stator may then be turned about easily. Vise and base are very light, and may be set aside or placed under the workbench when not in use.

WIRE STRIPPER

The usual method of making a wire stripper out of a piece of hacksaw blade is to bend it into a hairpin shape after having hammered the two ends over at right angles to form the cutting edges, and then sharpening them to a bevel. "This makes a stiff and more or less awkward tool to handle", said E. Maguin of the AAA Electric Motor Service, Los Angeles. "I wanted a tool with 'balance', easy to handle and one in which I could take off the cutting edges easily and sharpen them on the stone."

The result of his experiments was the tool shown in the sketch. Instead of turning over the ends of the power hacksaw blade for the cutting edges, always difficult to sharpen properly with a file, he inserted the ends in two small, slotted, aluminum blocks, with a driving fit. The two T-shaped cutting tools were fashioned out of an old file and fastened to the ends of the blocks as shown, by means of two screws with washers overlapping the blade at the interior corners of the "T".

Trying the old type, stiff in operation, in comparison with this improved tool with its easy thumb-and-finger-



Blue Streak IN PARTS CLEANING

Circo Chief DEGREASER

PROGRESS is the outgrowth of experiment and enterprise and the most progressive step made in the last twenty-five years in parts cleaning is the new modern Circo "Chief" degreaser.

You will find in the Circo "Chief" degreaser, record breaking speed in parts cleaning and drying never before attained and with this speed absolute cleanliness.

Man hours, consumed in old fashioned "bucket and brush" cleaning methods cannot begin to compete with the Circo "Chief" degreaser because the "Chief" will vapor clean and dry in a few minutes time, more work than a mechanic can possibly turn out in hours and do a much better job of cleaning. Circo "Chief" will actually hot vapor clean and dry dirty, greasy parts in three minutes without encroaching on the mechanic's time other than seconds used in putting parts in tank.

Consider these facts, the Circo "Chief" saves cleaning time, many hours—saves mechanic's time, which can also run into many hours—saves costly materials—eliminates the aftermath of mopping up the mess and does a far superior job of cleaning than is possible with any other method. Circo "Chief" cleans parts five different ways: vapor cleaning (automatic), drying (automatic), spraying (automatic), dipping and soaking.

You can't afford to be without a Circo "Chief" degreaser, not if you employ two or more mechanics . . . *Send in for free literature.*

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5 CLEANING METHODS IN ONE UNIT

For TEMPORARY WORK

For DECORATIVE LIGHTING



P&S BAKELITE PIN-TYPE SOCKETS

You can't go wrong when you specify P&S No. 5464.

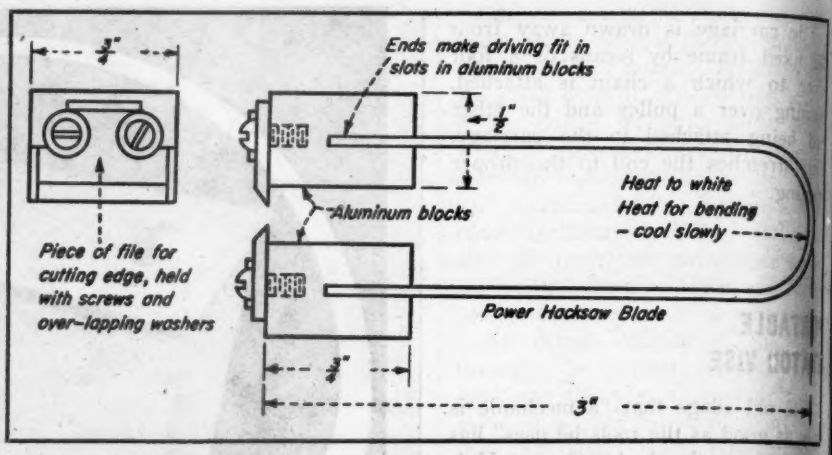
These Pin-Type sockets are applied directly to the wire without stripping. Sharp pointed screws pierce the insulation and make positive contact with the wire. The socket cap (equipped with easy-turn projections) screws down tightly and makes a firm installation. Sockets may be disconnected and used again.

Thousands of these P & S sockets have been doing their part in the war effort in shipyards all over the country.

Send for your copy of the P&S Catalog.

Sold Through Electrical Wholesalers

PASS & SEYMOUR, Inc.
SYRACUSE 9, N. Y.



Improved wire stripper is made from old hacksaw blade, aluminum blocks and pieces of old file. It is well balanced, easy to handle.

tip action, it was easy to believe that after stripping several hundred wires with the latter the hand would be much less tired.

Maguin cautioned against bringing the metal only to a red heat in making the bend, which he says will leave the blade brittle. Instead, make it white hot and then let it cool gradually, which leaves plenty of spring.

SMALL OVEN FOR QUICK REPAIRS

It's far from economical to start up a large bake oven to handle just a few small items and it takes longer than is sometimes desirable to bake small rush repair jobs in the motor service shop of Price Electric Company, Columbus, Ohio. So general manager Mel Walcutt decided to solve the problem by constructing a small infra-red oven.

Used primarily as an "emergency oven", the device consists of a sheet metal enclosure 40½ inches long, 17½ inches high and 17 inches deep, with a hinged cover on the front. The oven contains eight, 375-watt, 115-volt, infra-red heat lamps, four on each end of the enclosure. The porcelain sockets are spring-mounted to the sides to prevent lamp movement in case of expansion and contraction of the metal oven enclosure. To further confine the heat to the baking area of the oven, a galvanized sheet metal partition fits snugly over the bell-shaped portion of each group of four lamps. Each lamp projects sufficiently beyond the partition to permit easy replacement without disturbing the barrier.

The lamps are connected in a series-parallel circuit and controlled by a two-heat switch to provide a measure of temperature flexibility. When completed, the interior of the oven will be painted with aluminum paint to reflect the heat waves and an exhaust flue will be added to remove fumes generated during the baking process.



Small electric oven, utilizing infra-red heat lamps, will speed up baking of small parts and facilitate completion of "rush jobs" in this Columbus, Ohio, motor repair shop. When completed, oven will be painted aluminum on interior and have an exhaust flue.

DON'T SHIVER NEXT WINTER SAYS S. F. A.

..and don't swelter next summer!

says THE CHELSEA FAN

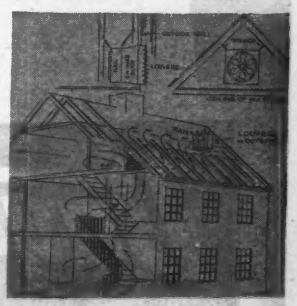


Orders now being booked for '46 deliveries!

Orders now being booked for '46 deliveries! The other side of the picture would say 'in winter, prepare for summer!' And now is the time to do it.

Whether for industrial, residential or institutional projects...CHELSEA will be able to meet your fan or ventilation needs early next year.

Do not delay—write for illustrated literature today. Determine your requirements and order promptly. Orders will be filled according to the date received.



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CHELSEA

FANS • EXHAUSTERS • VENTILATORS • CIRCULATORS • BLOWERS

it's easy to see when it's "Day-Brite"



CEILINGS FOR NEW *Sales!*



Where there's a ceiling, there's a sale for the quality that's easy to see when it's Day-Brite. . . . Many of these ceilings are already on blue prints--waiting for the backlog of new building, remodeling and re-lighting to be released. Then, as for many years past, Contractors and Wholesalers backed by the complete Day-Brite line will have a decided advantage.

The KINGSWAY
for Surface Mounting

This fixture has an overall luminous appearance, without the depressing effect of dark ends. Suitable for any length installation, in multiples of 2 ft., 4 ft. and 8 ft.

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LIGHTING FIXTURES

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THE SIGN OF *Quality* LOOK FOR THIS LABEL

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104

MODERN LIGHTING

ASYMMETRICAL LOUVER SPACING FOR BETTER LIGHT CONTROL

A new approach to better light control was revealed in a specially designed fluorescent lighting unit—the combined brain-child of the illuminating engineering and architectural departments of the Wisconsin Electric Power Company in Milwaukee. A two-fold purpose led to the development of the unit: to reduce brightness in the field of view; and to reduce the total amount of light coming direct into the eye from the fixture.

The problem was first encountered in the power company's accounting department where the employees had to roll out long glossy demand charts to read them. The former lighting, of 15 footcandle intensity, was of the general type utilizing semi-indirect incandescent units equipped with silver bowl lamps. To secure additional lighting intensity, IES student lamps giving about 50 footcandles were used to supplement the general lighting. Although there was more adequate light for the task at hand, these table lamps always got in the way of the long charts thus adding to the chore of reading them.

The ideal solution was a large-area localized lighting unit over the entire scanned area of the charts with a type of mounting that would leave a maximum of desk-top area free. A second consideration was to so control the light emanating from the fixture that the maximum controlled brightness would be confined to the work and the amount of light coming direct into the employees' eyes would be reduced to a minimum. Such a condition automatically concentrates the employee's eyes on the work; eliminates the distractions of "outside" brightness; and provides a comfortable seeing condition.

The lighting unit, shown in Figs. 1 and 2, utilizes a standard, three-lamp, 40-watt, industrial type fluorescent fixture enclosed in a special housing designed to accommodate 2-inch deep steel louvers at the bottom. Fig. 1 shows a front elevation of the unit with a cut-away section showing details of the flush type combination pull switch and convenience outlet installed in one end of the housing. Wiring to the unit is enclosed in one of the supporting pipe standards.

Cross-louvers (at right angles to the length of the unit) are spaced equidistant at approximately 6-inch intervals. The louvers running parallel to the length of the fixture are asymmetrically spaced—ranging from a $\frac{3}{8}$-inch spacing (nearest to the employee) to a $2\frac{7}{8}$-inch spacing (most distant from the employee). Fig. 2 presents a detailed cross-section of the unit showing the intermediate louver spacings. The cut-off angle varies from 15 degrees at the minimum louver spacing to 45 degrees at the maximum spacing. This reduces



Dual lighting unit with asymmetrically spaced louvers installed in the accounting department of the power company. Note the effect of the small cut-off angle on the employees. Controlled light is concentrated where needed most without discomfort to employees reading the glossy demand charts.

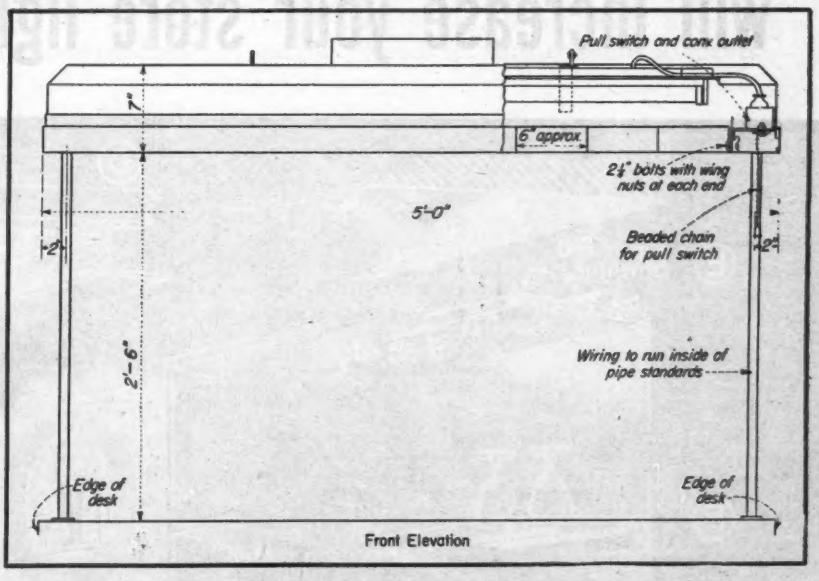
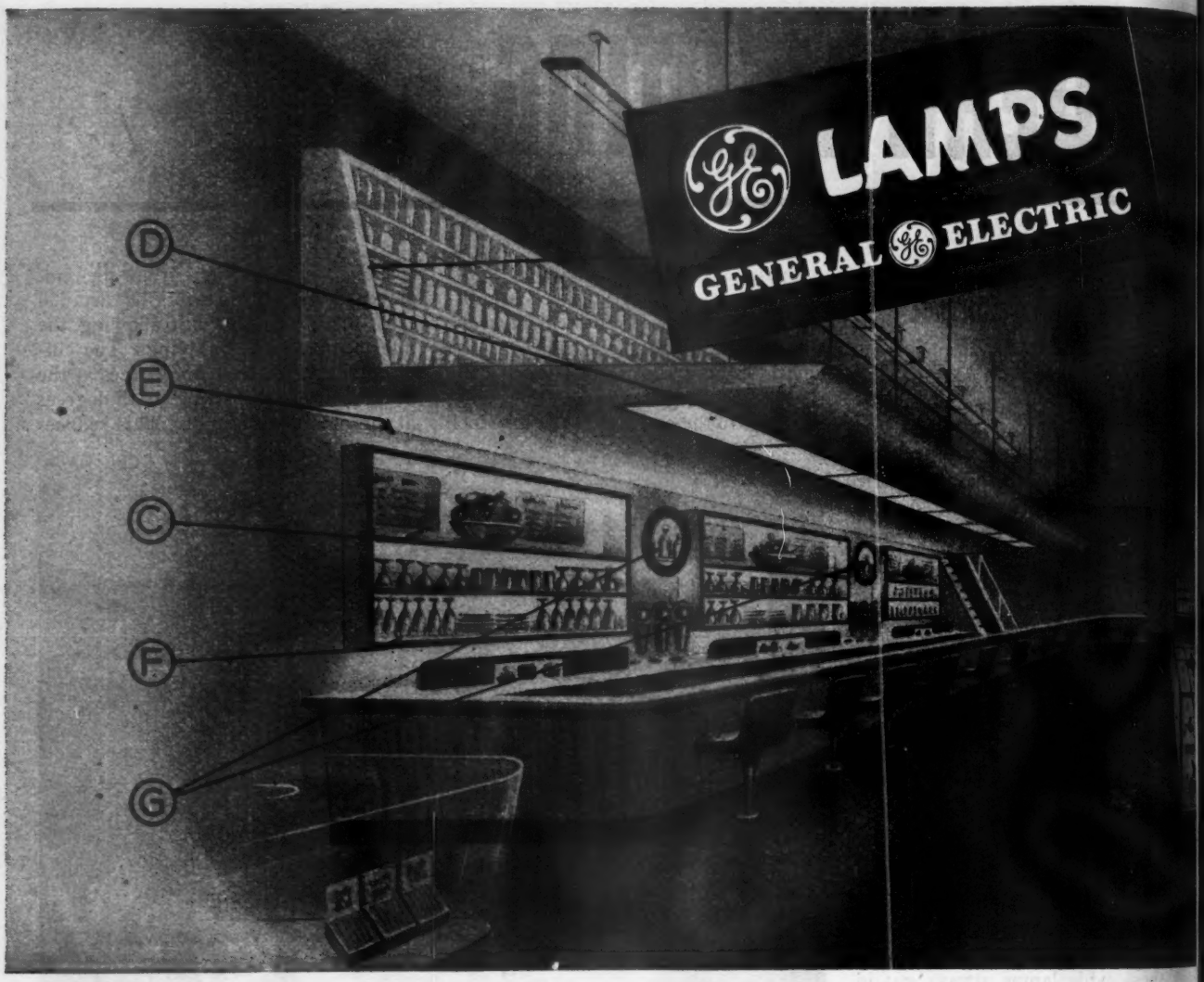
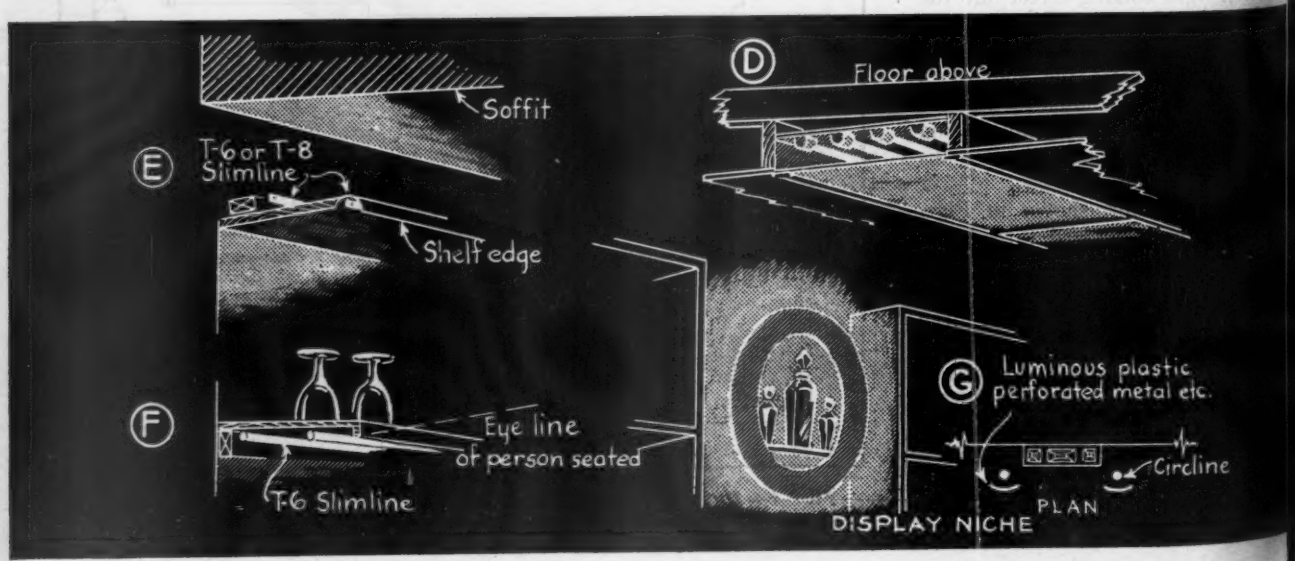
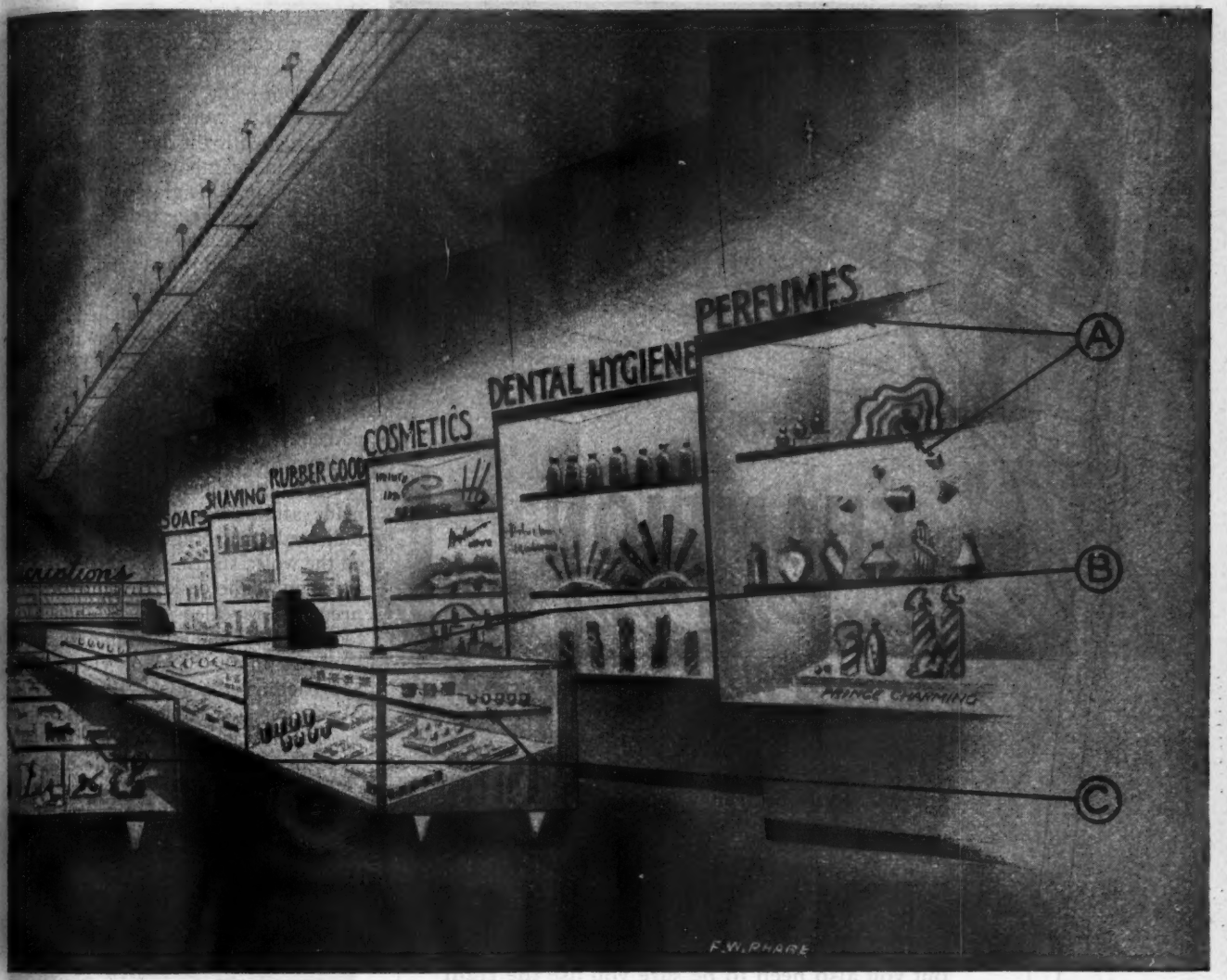


Fig. 1—Detail of special desk lighting unit showing pipe standard supports and cut-away section showing mounting of combination pull switch and convenience outlet in the fixture housing.



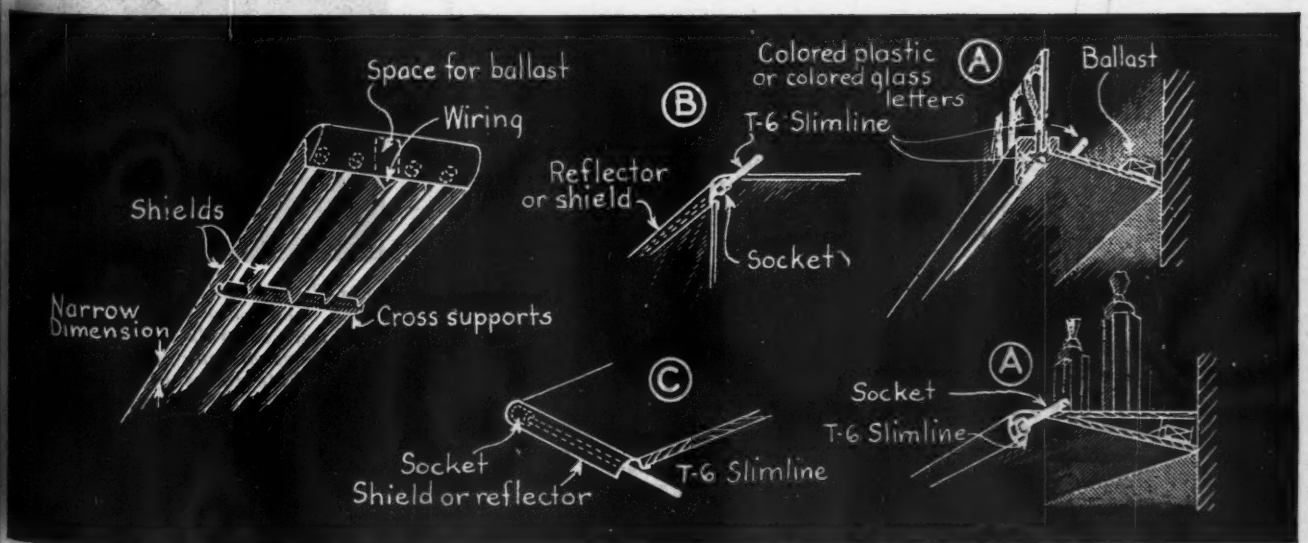
How the new G-E SLIMLINE and CIRCLINE Lamps will increase your store lighting profits!





NEW fluorescent light sources from G-E Lamp Research will help you do the biggest store lighting business in history. These ideas for the use of G-E SLIMLINE and CIRCLINE Fluorescent Lamps in a drug store are adaptable to almost any kind of store lighting job. Seeing is the biggest thing in selling and this is lighting that sells. Study these ideas . . . let them help you make your store lighting jobs outstanding.

G-E's new SLIMLINE Fluorescent Lamps are being made available in four lengths, 42, 64, 72 and 96 inches. The first two are ¾″ in diameter, the other two are one inch. The first G-E CIRCLINE Fluorescent Lamp (ready early next year) will be 12″ in outside diameter, with a tube diameter of 1¼″. Two additional circular lamps are planned, with outside diameters of 8½″ and 16″. Watch for further announcements.





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Lighting Puts Your Plant A Long Jump Ahead

Fine quality Fluorescent and *Incandescent* Lamps for industry are lamps bearing the Champion Diamond mark.

You need lamps of Champion Quality.

But you also need to be sure you use the right lamps to make the most of them for every plant and office activity and location.

That is why we have a lighting engineering service, prepared to provide you with experienced and unbiased counsel, and available to you without charge or obligation.

And that is why we offer you this Champion Maintenance Manual, chock full of helpful information on good lighting and ways to get the very best and longest service out of your lamps. It's yours for the asking. Simply let us have your name, position and company address.

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

to a minimum the amount of light that comes direct into the eye from the fixture. The entire louver is sprayed a blue-green color.

The units were mounted on pipe standards with the bottom of the fixture 30 inches above the desk top. It was found that the glossy surface of the demand charts reflected the image of the fluorescent lamps in the fixture—causing an additional strain on the reader's eyes. To eliminate this, a piece of tracing cloth was stretched over the top of the louvers (between the lamps and the louvers) to act as a diffusing medium. The addition of the cloth cut down the footcandle intensity about 30 percent, but provided a better quality and more comfortable light.

Lighting intensity measurements made after the units were in service indicated an average of 85 footcandles on the work, starting six inches in from the edge of the desk. Brightness measurements revealed a maximum of 28 foot-lamberts and a minimum of 3 foot-lamberts in the field of view, closely approaching the ideal 10 to 1 ratio. Maximum foot-lamberts measured on the paper was 68. Two lighting units were installed on the double desk.

A second practical application of this newly designed fixture was made

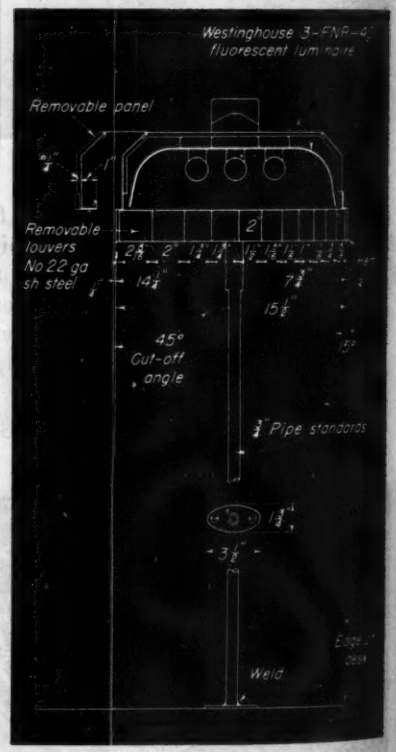
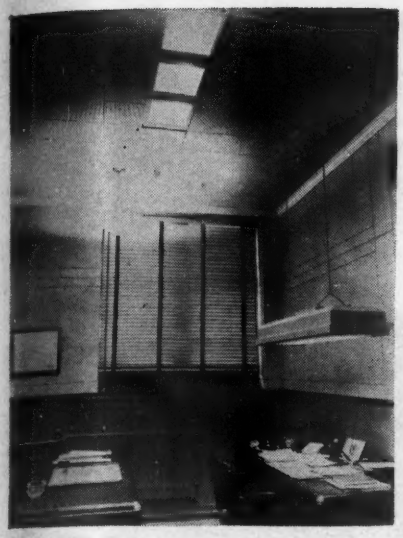


Fig. 2—Asymmetrical spacing of 2-inch deep louvers across section of the unit controls amount of light that goes directly into employee's eyes. Note range of cut-off angle (from 15 to 45 degrees). A sheet of tracing cloth stretched over top of louvers acts as a diffusing medium and eliminates reflected image of fluorescent lamps on glossy surface of demand charts being studied on desk.



Private office installation of a similar unit. Engineer's desk top is flooded with 70 foot-candles of controlled brightness illumination. Lens units are for concentrating light on the conference table directly behind the desk.

in a private office of a manufacturing plant. The engineer occupying this office was constantly reading and studying blueprints and specifications. Excessive brightness of the existing lighting system was raising havoc with his eyes. The new fluorescent unit with its asymmetrical louver spacing and resultant controlled brightness qualities was the answer to the problem.

The fixture was chain suspended from the ceiling directly over the desk with the bottom of the fixture 36 inches above the top of the desk (the engineer being a tall person). Now, there is an average of 70 footcandles of illumination on the desk top. Brightness measurements indicated a maximum of 35 foot-lamberts and a minimum of 5 foot-lamberts in the field of view. Fifty-five foot-lamberts were measured on white paper on the desk top.

Other lighting in the office consisted of two 500-watt, semi-indirect, incandescent units for general lighting and four 150-watt, incandescent flush lens units in the ceiling which concentrated 37 footcandles of controlled light on the conference table directly behind the engineer's desk.

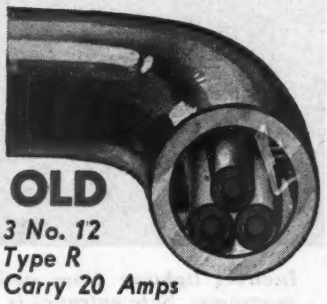
AISLE LIGHTING WITH BLACK LIGHT

Anyone who has had the experience of entering a darkened theatre auditorium, and stumbling down a dark aisle in search of a vacant seat, will approve the use of fluorescent carpeted aisles. Entrance and egress is now facilitated and made safe by using carpets which glow softly in varying pastel colors while the movie audi-

RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES • PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • BUILDING WIRE • SYNTHOL WIRES • ENTRANCE CABLE • WELDING CABLES • SERVICE CABLE • SHIPBOARD CABLES • NON-METALLIC SHEATHED CABLE • ARMORED CABLE • CRESFLEX

See how

CRESCENT SYNTHOL TYPE T



OLD
3 No. 12
Type R
Carry 20 Amps



NEW
3 No. 8
Type T
Carry 41 Amps

Permits

DOUBLE THE AMOUNT OF COPPER in *Existing Raceways*

Illustration shows ½" conduit

Under present conditions there is urgent need for an economical and quick way of adding to the current carrying capacity of branch circuit conduits already installed. Increasing numbers of electrical appliances, air conditioning units and other equipment call for greater load on these branch circuits.

A simple solution to this problem is to replace present wiring with CRESCENT SYNTHOL Type T (formerly Type SN), which offers an easy and low-cost way approximately to double the current carrying capacity of the existing raceway.

An even greater increase in carrying capacity can be secured by wiring with CRESCENT Type TW in place of lead covered cable in wet locations.

Write for Descriptive Folder on SYNTHOL Type T and Type TW

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

CRESCENT
WIRE and CABLE

NEMA

IMPERIAL NEOPRENE JACKETED PORTABLE CABLES •



SWITCH TO..

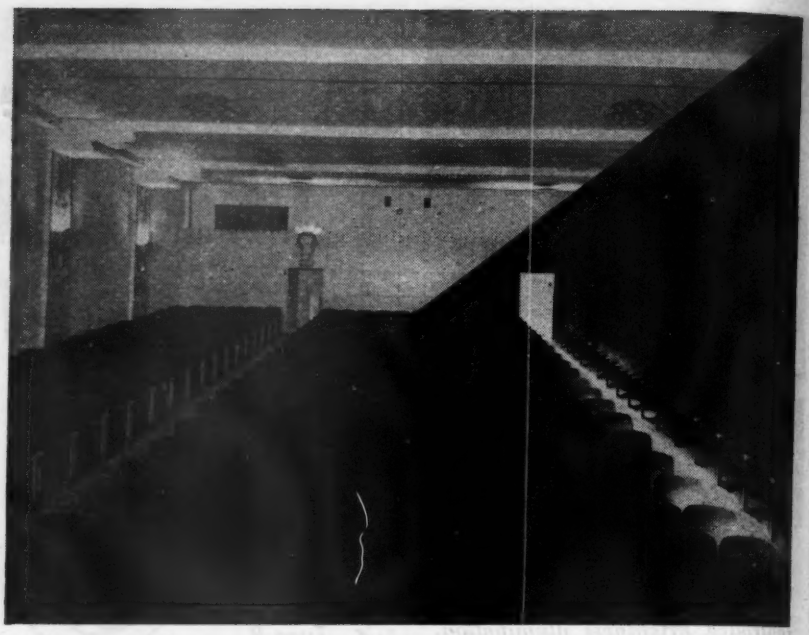
Safety

That's where Levolier Switches come in. In tests they have taken over 168,000 pulls — on and off — without trouble or a miss. Over a lifetime of actual service. Levolier switches are hand assembled and individually tested, and listed by Underwriters' Laboratories.

Use them in Fluorescent installations, individual light, or F. H. motor control. They are made in 3 to 10 ampere capacity, single pole, two circuit, series multiple and three way pull. Ask your Electrical Wholesaler about Levolier Switches . . . Switch to Safety.

Levolier

McGILL
MANUFACTURING CO., INC.
Electrical Division
VALPARAISO INDIANA



Indirect lighting from wall urns lights theatre auditorium between programs. Safe entrance is assured during program by use of fluorescent carpeted aisles, caused to glow by ultraviolet radiation reflected from concealed ceiling units.

torium is darkened for program presentation.

These carpets look like ordinary floor coverings under normal artificial or natural light. By using fluorescent dyes in forming the decorative patterns of these rugs, they can be made to glow softly, or fluoresce when exposed to non-visible ultraviolet radiation.

The upper left hand part of the accompanying photograph shows a theatre auditorium lighted normally for intermission, or for opening and closing of program. This lighting is indirect, and comes from the special design wall urns. Each ornamental urn conceals a reflector which produces an asymmetric light pattern, and a 200 watt inside frost standard lamp. These lamps are connected to a dimmer-controlled circuit, which permits change of illumination intensity from full brightness to blackout.

The lower right hand part of the photograph shows the same theatre auditorium as it appears during picture presentation. The incandescent wall urns have been dimmed until the light intensity is less than one-tenth footcandle. Yet the rug and rear exit door glows with light. Adequate lighting prevails to permit safe entrance and exit, while the program is being featured. This illumination is not sufficiently bright, however, to interfere with the efficiency of screen reflection.

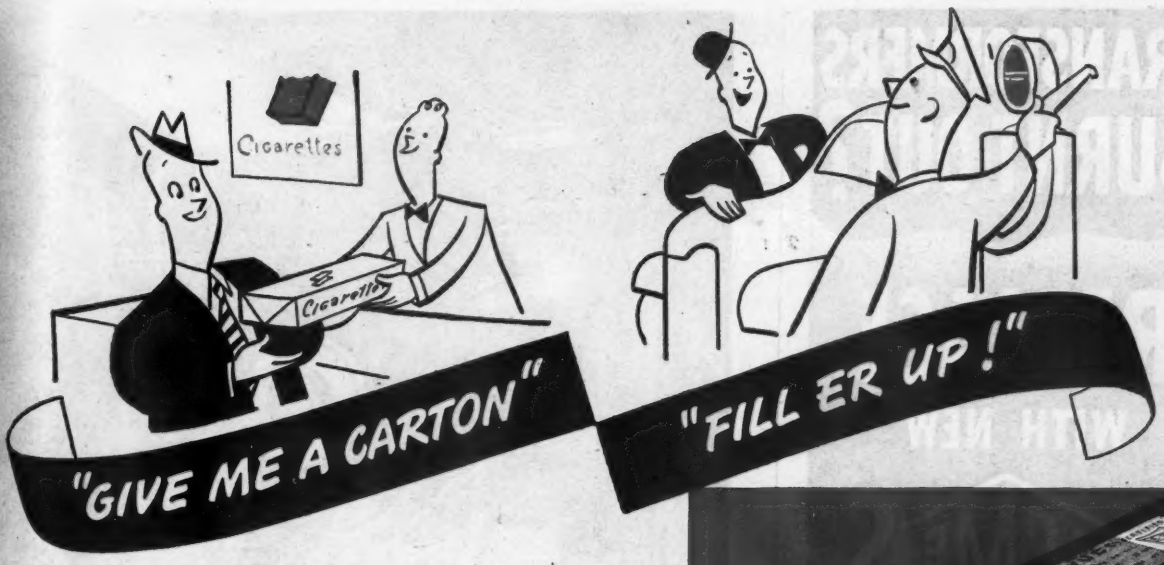
The non-visible ultraviolet radiation used to activate the fluorescent dyes in the rugs and the fluorescent painted rear door, is produced by concealed equipment recessed above the ceiling. A 250 watt mercury vapor lamp is used in a reflector equipped with a special ultraviolet glass filter cover. The filter absorbs all visible radiation, but transmits the non-visible ultraviolet radiation required to activate the fluorescent dyes and pigments in the carpets and on the doors. Three ornamental glass discs with large center openings are suspended from the ceiling, about six inches apart. These glass discs add a decorative touch, and shield the ultraviolet equipment recessed in the ceiling from normal viewing angles.

Fluorescent carpeted aisles provide greater safety to patrons entering and leaving the auditorium. They add a decorative touch, and build good will. Many theatres will now recarpet their aisles as part of their postwar modernization program. A large majority will want this new type carpet which provides a "path of light" to each of the auditorium's row of seats.

LIGHTING DUST HAZARD AREA

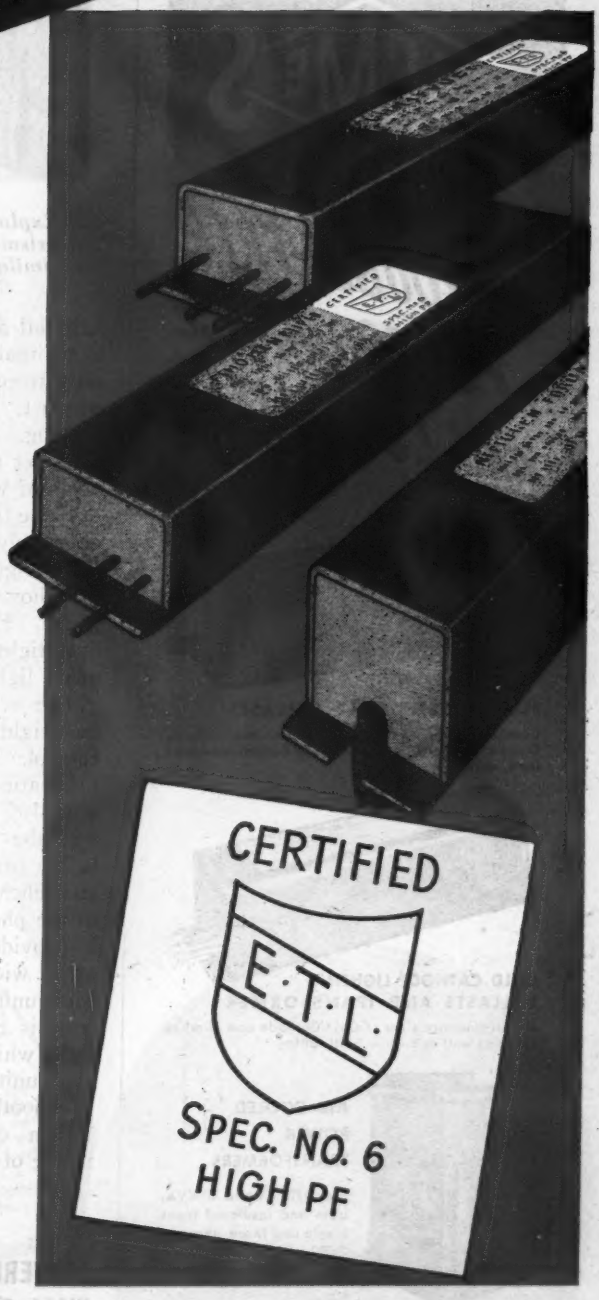
The lighting of feed mills presents a double problem. Because of the dust hazard, it is necessary to use lighting units which are thoroughly sealed, to prevent the seepage of dust into the unit. Collection of feed mill dust within a lighting unit creates a potential explosion hazard, in that any sparking within the unit might easily set off an explosion of the dust. Such explosions usually result in fires.

It is also necessary to adequately



. . . and won't it be great when you can always give your fixtures the sales appeal of

Certified Ballasts



Yes sir, there's no getting around it. Fluorescent fixtures do have greater sales appeal with Certified Ballasts. And here are the reasons why:

1. **Certified Ballasts are made** to give top performance and dependable service . . . as your customers know.
2. **They're built** to definite specifications . . . to assure better lamp performance, as leading fluorescent tube makers recognize. Because, with Certified Ballasts, they will guarantee lamp performance.
3. **They're subject** to exhaustive testing by famous Electrical Testing Laboratories, Inc., and Certified by them as meeting the specifications.

Good reasons why you'll want the confidence-building power of Certified Ballasts behind *your* fixtures!

Incidentally Certified Ballasts will be ready as soon as materials are freely available . . . *ready as soon as any.* Make this Certification label part of your buying specifications . . . for greater sales appeal tomorrow!

Certified Ballast Manufacturers

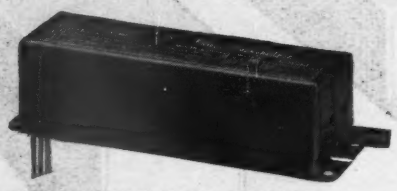
MAKERS OF BALLASTS FOR CERTIFIED FLUORESCENT LIGHTING FIXTURES

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for TROUBLE-FREE PERFORMANCE and LONG LIFE



FLUORESCENT LAMP BALLASTS

Complete range of sizes for all lamp applications. Quick-start and standard designs. Bottom lead, end lead, universal lead types.



COLD CATHODE LIGHTING BALLASTS AND TRANSFORMERS

For all standard sizes of Cold Cathode and Slimline tubes as well as custom built tubing.

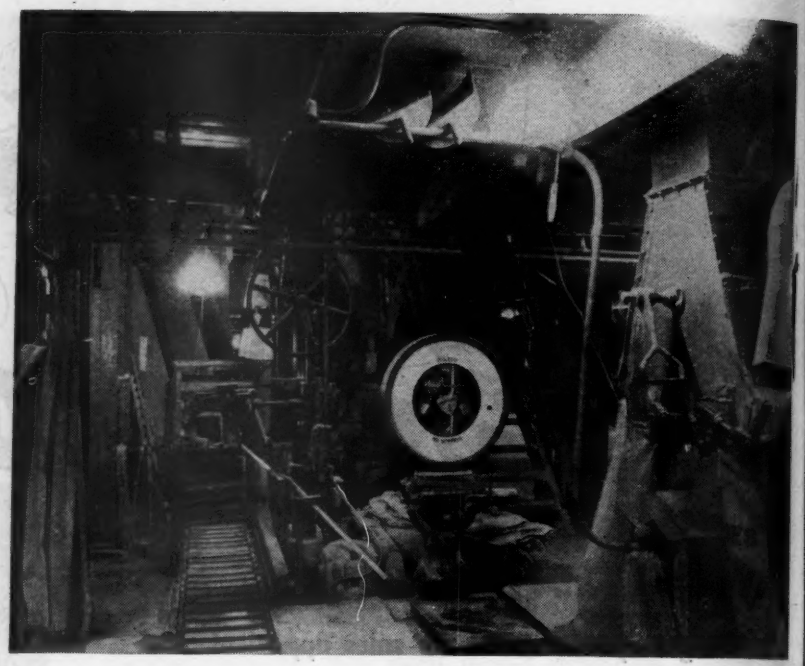


AIR COOLED POWER TRANSFORMERS

From 1/10 KVA to 50 KVA, auto and insulated types single and three phase to 2400 volts primary

THE ACME ELECTRIC & MFG. CO.
GENERAL OFFICES: CUBA, N. Y.

Acme ACME Electric
TRANSFORMERS



Explosion protection and light control are both incorporated in these prismatic glass dust tight units lighting a feed mill. Thousands of similar change-over lighting jobs are awaiting attention of contractors.

light all areas of feed mills, in order to maintain efficient production, make adjustments on machinery, inspect product, and weigh accurately for packing. Light control is also needed, to direct the light to the most critical areas of work.

These two problems have been solved effectively in relighting the bagging and weighing department of the feed mill shown in the accompanying photograph. Former equipment used was dust tight, but failed to provide adequate light control.

The new lighting units afford both dust tight protection and efficient light control. The units used are Holophane prismatic dust tight units, equipped with 100 watt lamps only. They control the light by directing the rays to the proper angle for most effective and efficient lighting, as will be noted in the photograph. Excellent visibility is provided on the face of the scales, and a wide illumination coverage from each unit can be noted. Ceiling contrast is reduced by a small amount of light which is directed upwards from each unit. The exterior of these units is smooth, making maintenance easy. Prism control surfaces are on the inside of the glass globes.

LOUVERED FLUORESCENT WALL-CASE LIGHTING

When the Gorham Company, nationally known silverware manufacturers, of Providence, R. I., built new showrooms, they and Albert Harkness, the architect, realized the importance of light in the display of the product. They wanted distinctive, practical and effective illumination in their display areas. So the Thompson Engineered Lighting Co., Boston, designed and Scannevin & Potter, Providence contractors, installed a unique fluorescent wall-case lighting system.

Each of the flush wall-cases is approximately 4½ ft. by 4½ ft. by 2½ ft. deep and contains three shelves. The interior of these cupboards are lined with a peach colored material to enhance the silver plate display. The front of each case is enclosed by sliding glass panels.

The lighting consists of one 48 in., 40 watt soft white fluorescent lamp mounted vertically in the partitions between the cases. A special double reflector, designed so one lamp will illuminate two cases is used in these partitions. For corner jambs, a single reflector is employed. Each fluorescent lamp is concealed by a panel of Louverglas, mounted in a metal frame. It is so effective that the observer cannot see the light source, while viewing the display from normal angles.

Each unit is equipped with a wiring trough, surrounded by an air space and mounted to a ¼-inch asbestos backboard in the cupboard partition. The auxiliary equipment is mounted above the cases and serviced from a catwalk in the accessible furred space at the rear of the cases. All wall-case lighting is controlled from one panel in the showroom.

Lighting from the sides, rather than from the top or bottom was used to in-

WANT TO BOOST LIGHTING PROFITS





JOLECO FLUORESCENTS GIVE MORE LIGHT, FAST INSTALLATION, LESS MAINTENANCE!

These four reasons, among many, are why Joleco Fluorescents can give a big lift to your lighting fixture profit picture —

★*On-the-point positioning doubles reflecting surfaces to greatly increase light intensity.*

★*Single-piece, sturdily reinforced body means fast, easy one-man installation.*

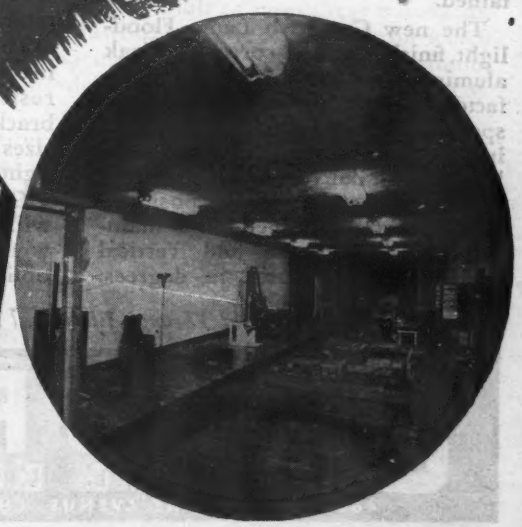
★*Patented method of ventilation utilizes principle of air-draft cooling to prolong ballast life.*

★*Quickly removable inspection plate gives complete and instant access to fixture body thus saving time, labor and trouble.*

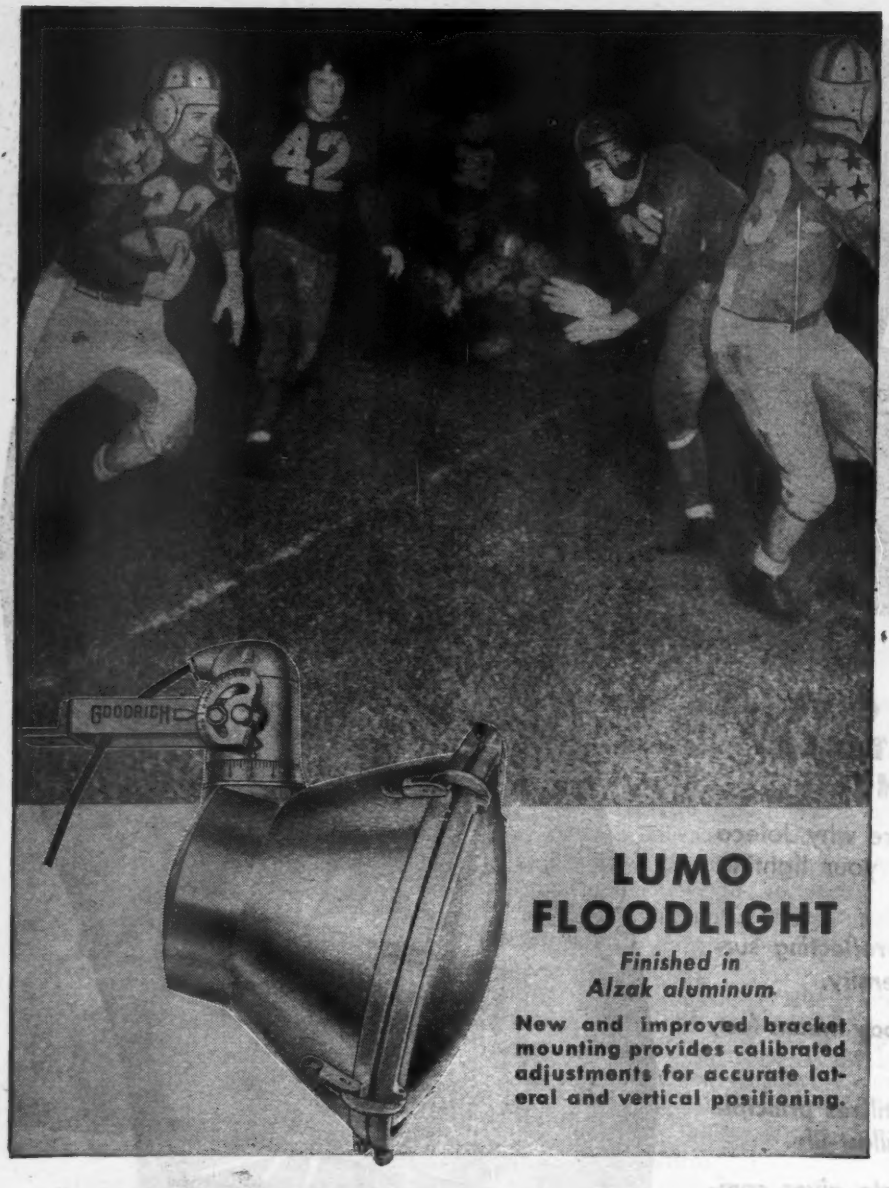
The extra sales punch which Joleco's many exclusive features provide — the trouble-free performance, increased production, better sales display, and brighter living that comes from improved illumination — all insure a healthy boost in *your* fluorescent fixture profit picture.

Remember next time to recommend and specify Joleco Fluorescents!

Joleco Fluorescents emphasize the quality and workmanship in this display of equipment for the rehabilitation of our wounded men of all branches of service at Atlas Athletic Equipment Company, St. Louis.



JOLECO
CORPORATION
Designers and Manufacturers
FLUORESCENT LIGHTING FIXTURES



LUMO FLOODLIGHT

Finished in Alzak aluminum

New and improved bracket mounting provides calibrated adjustments for accurate lateral and vertical positioning.

IMPROVED FLOODLIGHTING *for Night Sports*

Now, floodlight of large sports areas can be better than ever—and illuminating efficiency more easily maintained.

The new Goodrich Lumo Floodlight, finished in non-corrosive Alzak aluminum, assures a continuous high factor of light reflection. Designed specifically for long range floodlighting—for use individually or in combination—it delivers either a narrow or medium beam. Accurate positioning is easily obtained—and maintained—with lateral and vertical adjustments calibrated in degrees.

When servicing, the floodlight is tipped upwards and back on its hinged bracket mounting. After lamp is replaced or reflector cleaned, it is returned to its exact calibrated setting.

The Lumo Floodlight is available in open style or with watertight, heat-resisting glass lens, for pole or bracket mounting. It is one of many sizes and styles of Goodrich floodlights.

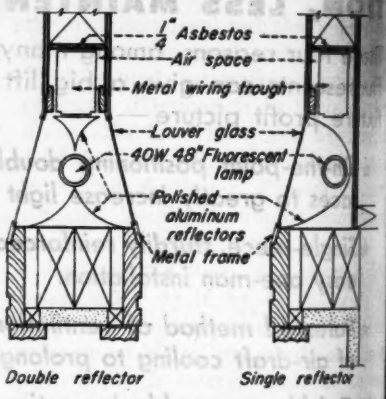
Goodrich illuminating engineers will gladly advise and assist you with your lighting plans, without cost or obligation. Write us.

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Glareless light is evenly distributed over all shelves in these silver plate display cabinets. Louverglas panels completely hide the fluorescent lamps from view. Note dark appearance of fixtures in the partitions.



Detailed section of the fluorescent units showing single and double reflector design permitting one lamp to serve two cases. Louverglas panels are supported in metal frames.

sure the same light intensity at the top, bottom and each shelf in the case. The result of this engineered lighting installation is 25 footcandles of evenly distributed, well directed soft light from a cleverly concealed light source.

Although this installation was specifically designed for the display of silverware, the idea has possible applications wherever well directed, evenly distributed light with total elimination of glare is desired. It is worth careful consideration when such problems arise. With the availability of the new 13 watt T-5 21-inch long fluorescent lamp, and the new line of "slimline" lamps, which vary from ¾-inch to one inch in diameter, the ingenious contractor and lighting engineer will find many applications of similar nature, where space is at a premium.

Dependable Guides



to the best in INDUSTRIAL LIGHTING EQUIPMENT

RLM STANDARDS INSTITUTE SPECIFICATIONS

RLM Specification No. 1—
Dome Reflector

RLM Specification No. 2—
Deep Bowl Reflector

RLM Specification No. 3—
Symmetrical Angle Reflector

RLM Specification No. 5—
48" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit

RLM Specification No. 6—
48" Fluorescent Three-Lamp Closed-End Porcelain Enamel Unit

RLM Specification No. 7—
60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit

RLM Specification No. 8—
60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Diffuser Unit

RLM Specification No. 9—
48" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit

RLM Specification No. 10—
48" Fluorescent Three-Lamp Open-End Porcelain Enamel Unit

RLM Specification No. 11—
60" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit

RLM Specification No. 12—
60" Fluorescent Two-Lamp Open-End Porcelain Enamel Diffuser Unit

★RLM Specification No. 18—
Glassteel Diffuser.

★New RLM Approved Unit

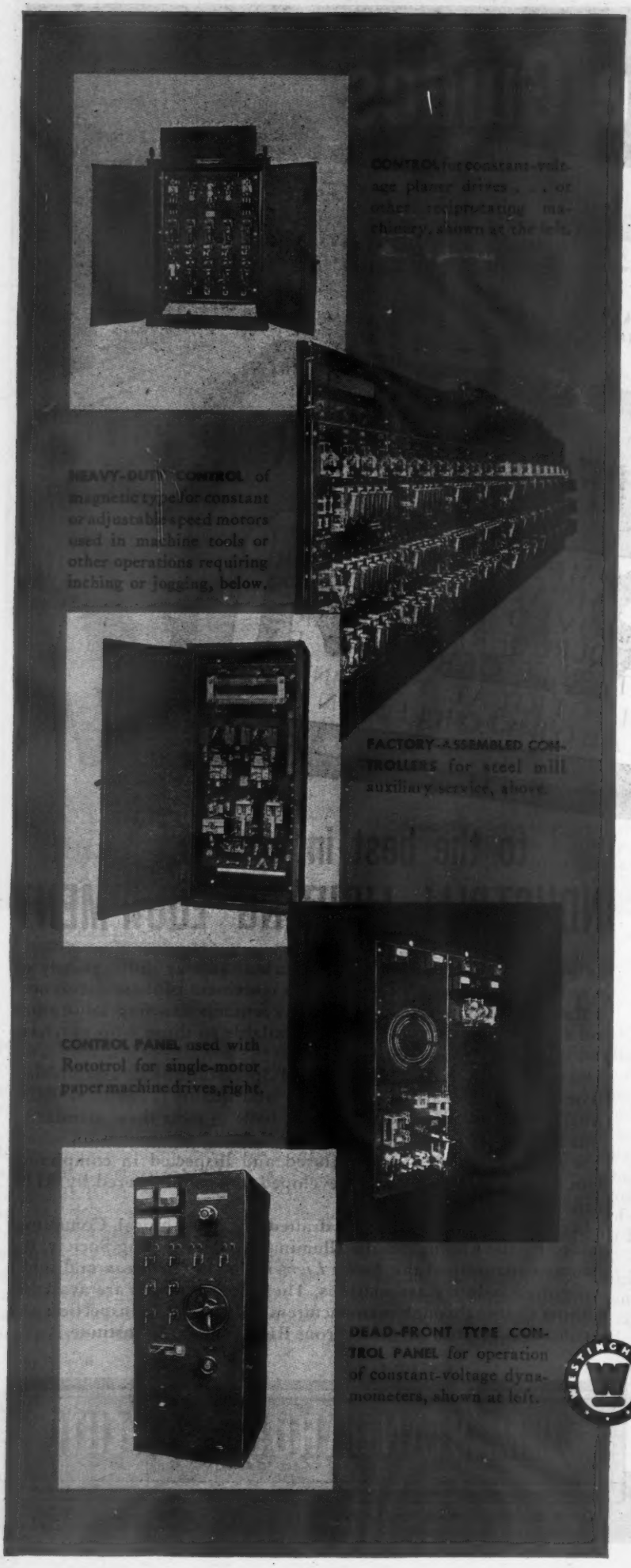
Lighting reflectors that look very much alike may differ greatly as to quality and efficiency. Accurate measurement of these differences at the time of purchase is difficult . . . requires exacting laboratory and engineering tests not readily available to those who purchase and specify lighting equipment.

Hence the value of RLM Standard Specifications in establishing basic standards of efficiency, design and quality . . . and the RLM Label to identify lighting equipment built to meet these standards. This label certifies that the industrial lighting equipment on which it is affixed has been manufactured and inspected in compliance with the exacting procedure developed and administered by RLM Standards Institute.

Every RLM specification is drafted by a Technical Committee guided by the findings of the Illuminating Engineering Society, the recommendations of the *Better Light-Better Sight Bureau* and other recognized industry associations. These specifications are available without charge through manufacturers utilizing RLM inspection and certification service, or direct from RLM Standards Institute.

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. Michigan Ave., Suite 420 Chicago 1, Illinois



CONTROL for constant-voltage planer drives . . . or other reciprocating machinery, shown at the left.

HEAVY-DUTY CONTROL of magnetic type for constant or adjustable-speed motors used in machine tools or other operations requiring inching or jogging, below.

FACTORY-ASSEMBLED CONTROLLERS for steel mill auxiliary service, above.

CONTROL PANEL used with Rototrol for single-motor paper machine drives, right.

DEAD-FRONT TYPE CONTROL PANEL for operation of constant-voltage dynamometers, shown at left.

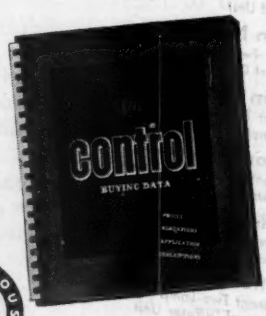
For any D-C Control

A MOTOR STARTER OR COMPLETE MILL CONTROL

Check Westinghouse

You may never need these specialized controllers shown on this page—for cranes, planers or paper machines—but the same excellence in engineering, design and manufacture goes into every Westinghouse control device. Should your particular problem require special help, call a Westinghouse engineer to review your requirements and make the necessary recommendations.

Westinghouse motor control covers the entire range of standard a-c and d-c controls and accessories for every type of drive, plus many specialized types of control shown here. For help on any control problem, it pays to first call Westinghouse. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60008



Send for this booklet

The entire range of Westinghouse standard motor control is covered in this 290-page Buying Data Book. If you do not have a copy, phone your Westinghouse office for Catalog No. 7000.

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PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Motor Control

Answered by
F. N. M. SQUIRES
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.
and
GLENN ROWELL
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

QUESTIONS ON THE CODE

PANEL SWITCH AS MOTOR DISCONNECT

Q. *We have a 5 hp. motor rated at 20 amperes and want to connect it to a 30 amp. switch on a panelboard. Can this 30 amp. panel switch serve as the disconnect for a magnetic starter and motor?*—M.L.

A. No! Undoubtedly the switch on the panel is rated only in amperes and not in horsepower—it will not satisfy the Code requirements for a disconnect switch. The Code requires that a horsepower rated switch be provided ahead of a magnetic starter. The motor circuit could be connected to the switch on the panel provided the horsepower rated switch was also provided. —F.N.M.S.

SERVICE RACEWAY

Q. *Does the Code require that the neutral wire be bonded to the service raceway at the pothead and that the lower end of the raceway be grounded?—R.B.S.*

A. No, the N. E. Code under Section 2532 requires that the service raceway be grounded but it does not make it necessary to bond the raceway to the neutral at the pothead. This is, however, an excellent precaution for lightning surge protection and many utilities have included such a requirement in their construction standards. The R.E.A. have made it part of their wiring specifications as farm properties are as a rule rather exposed and more subject to lightning than urban buildings. Without such bonding a lightning surge attempting to reach ground via the neutral ground attached within the service equipment would in many instances encounter so much resistance passing through the metal enclosure that it would arc across fusing the wires and conduit. Numerous fires have been caused by such lightning surges when the arcing between the unbonded but grounded raceway and the service conductors occurred adjacent to a combustible wall or building eave.—G.R.

EXPLOSION-PROOF EQUIPMENT

Q. *"Does the Code require the use of explosion-proof electrical equipment in a soybean oil extraction plant?"*—H.W.M.

A. There are several different processes used for the extraction of oil from soybean meal. If the solvent process is used in the plant in question, any area in which the extraction or distilling process is conducted would be considered a Class I Group D location and would require the use of explosion-proof electrical equipment. That part of the plant used for the storage, cleaning or grinding of the beans if separated from the extraction and distilling area must be considered as Class 2 Group G location and equipped with a dust-tight wiring system. If the oil is extracted by expellers or hydraulic presses, the entire plant may be considered a Class 2 Group G location and wired accordingly.—G.R.

OVERCURRENT PRODUCTION

Q. *"We are installing from transformer banks just outside of a building, two services to feed the building. One service is a four wire two phase, used for power, and the other one is five wire two phase for lighting. The two services are not taken from the same transformer. For the protective devices for these transformers, can we use for the power service, a three pole circuit breaker with trip coils in two of the phase wires and for the lighting service a four pole circuit breaker with two trip coils in two of the phase wires?"*—S.R.

A. Underground service conductor Rule 2371 requires that each be provided with overcurrent protection. Therefore the use of two trip coils alone, as outlined above, would not satisfy the requirement.

There is, however, one possibility which is not to be recommended but is to be discouraged. This is found in footnote 5 to Table 28 of the Code. This permits, only where standard devices are not available with three or four overcurrent units, to use the two overcurrent units (trip coils) and one fuse where three units are required and two overcurrent units and two fuses where four units are required. Of course the fuses are to be placed in the wires not having the overcurrent units.—F.N.M.S.

A TWO WIRE SERVICE

Q. *"When a building is serviced by a two wire service, is it permissible to use a single conductor for the neutral for two hot wires if the neutral is sufficiently large? I have wired many buildings in the past in this manner, but our new inspector refuses to accept it now saying that it is a Code violation."*—H.H.

A. Your new inspector is correct. A multi-circuit can be used only when the ungrounded conductors have a potential difference between them and an equal potential difference between each ungrounded conductor of the circuit and the identified neutral conductor. Obviously a building served by only two wires could not contain ungrounded conductors having a potential difference between them. This ruling may be found under Section 2104 of the National Electrical Code. —G.R.

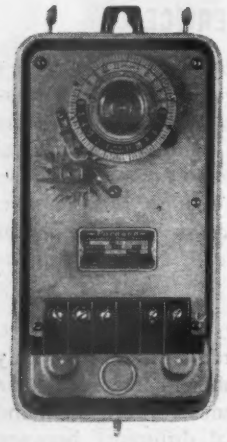
GRAIN ELEVATOR INSTALLATION

Q. *I plan to connect several 220 volt single phase motors located in the cupola of a country grain elevator. The service equipment is in the office, and it is approximately 180 feet*



Mr. Tops, the Paragon symbol of top quality.

TOP QUALITY POULTRY HOUSE TIME CONTROLS



Model PS

TO insure Fall delivery place your order now for Paragon Top Quality Poultry House Time Controls. Paragon "PS" models are designed for both morning and evening lighting, with dimming period for roosting. The Paragon Model 301 is designed essentially for morning lighting only. It is a heavy duty, industrial type time switch adaptable to poultry house lighting. It is truly a superior instrument of high quality and low price. All Models are synchronous motor operated and available . . . Without priority ratings.

Send for Authoritative Bulletin

Paragon has prepared a 4-page, 2 color bulletin containing authoritative information relative to poultry house lighting control . . . location of lights, selection of light control switches, etc. It summarizes the recommendations of leading poultry authorities and gives complete data regarding the wide range of Paragon poultry house time switches... Also, attractive envelope stuffer available in quantities for your distribution.



Model 301

PARAGON ELECTRIC COMPANY
710 Old Colony Building
Chicago 5, Illinois

Paragon Chicago
BUILDERS OF ELECTRICAL EQUIPMENT . . . SINCE 1905

from the service to the cupola. There will be two 3 horsepower and one 1 horsepower motors in this cupola, and at present there is a ¾-inch conduit run from the work floor to the cupola. The total load in amperes will be 33½ amperes, yet I have been informed that No. 8 wires are too small and that the present ¾-inch conduit will have to be replaced with a larger one. Can you explain Code rules covering such an installation?—J.W.

A. The first factor which should be considered in this case is voltage drop. Section 2202 of the N. E. Code requires that feeders supplying motor loads be capable of supplying current with not more than a 3 percent drop in voltage. The proper size of conductor may be determined as follows:

$$\text{C.M.} = \frac{\text{Amperes} \times 2 \times \text{length of circuit} \times 10.8}{\text{Voltage drop}} \text{ or}$$

$$\frac{33.5 \times 2 \times 180 \times 10.8}{6.9} = 18{,}876 \text{ C. M.,}$$

or No. 6 conductor.

The second factor is found under Section 4314 which requires conductors supplying more than a single motor to have a current carrying capacity of 125 percent of the full load current of the largest motor plus the sum of the full load current ratings of the remainder of the motors to be connected. This in your case would amount to a total of 37 amperes, but inasmuch as No. 6 conductors are required to conform to voltage drop limitations this latter calculation may be dropped. Two No. 6 Type R conductors cannot be pulled in a ¾-inch conduit but two No. 6 Type T conductors could be pulled into this existing conduit run. A Type T conductor is the new designation for the old Type SN.—G.R.

BONDING JUMPERS

Q. *"We refer to Article 2612 (a) of the N.E.C. relative to 'Grounding Conductor Connections To Water Pipes'. The facts in this matter are as follows: There are a few new buildings being constructed on the site of an existing institution. The buildings are of modern fireproof heavy construction. The water distribution system is an underground metallic system. There are no water meters in the buildings.*

"The distance from the point of entrance of the secondary electric service to the point of entrance of 4 ft. water service varies from about 50 feet to

200 feet for the various buildings. We have elected in each instance to attach the common grounding conductor to a water pipe of adequate current carrying capacity nearer the electric service.

"There are no water meters or service unions involved.

"There are, however, some flanged type water valves which occur between the point of water service entrance and the point of ground attachment. These valves are made up with companion flanged fittings by a circle of machine through bolts and nuts. There is a rubber gasket between the flanges, but of course it has the required openings for the water and the bolts to pass through.

"The question is this: Does the N.E.C. require that bonding jumpers be provided across any of these flanged type valves?"—M.A.E.

A. Section 2612a states that where attachment of the grounding conduits to the water pipe is not on the street side of the water meter, the water piping system is to have all parts between the attachment and the pipe entrance made electrically continuous by bonding *all parts which are liable to become disconnected.*

If therefore, there is any doubt about the electrical continuity through any fitting, especially one which has an insulating gasket, that fitting should be bonded.—F.N.M.S.

RECEPTACLE IN FEED MILL

Q. *Does the Code require that a receptacle in a feed mill be equipped with an interlocking switch of dust tight construction?—S.M.*

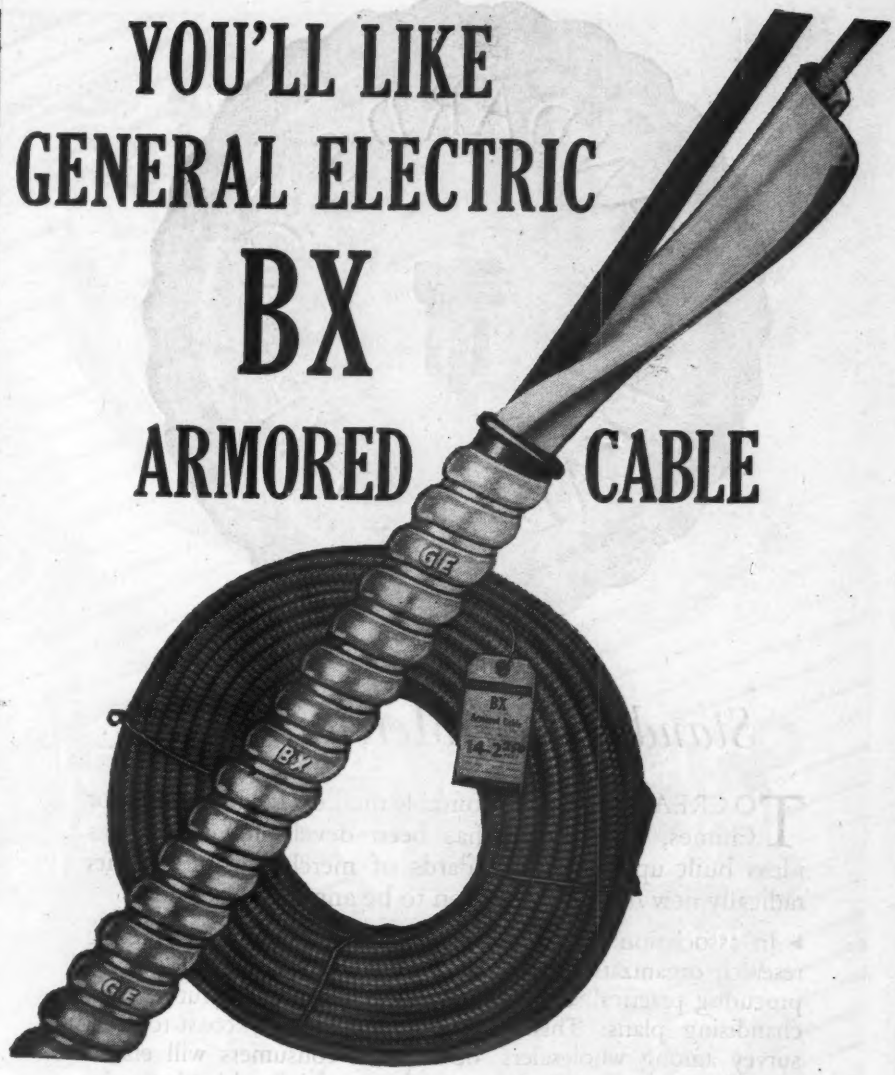
A. No, the N. E. Code under Section 5062 requires that a receptacle installed in an explosive Class 2 location be either of the interlocking type or so designed that during removal or insertion of the attachment plug the circuit will be broken or made within a dust tight enclosure.—G.R.

MOTOR DISCONNECT SWITCH

Q. *"Can the fuse pull out type of switch be used as a motor disconnect switch?"*—J.H.

A. If the device has a horsepower rating marked on it, it can be used as a motor disconnect switch ahead of a motor controller. If rated in amperes only, and not in horsepower, it cannot be used thus.—F.N.M.S.

YOU'LL LIKE GENERAL ELECTRIC BX ARMORED CABLE



This high quality cable is easy to install. Its sturdy interlocking armor is flexible. Its S-shaped paper wrap is easier to remove than ordinary wraps when stripping. Incidentally, this wrap provides additional dielectric strength too. It separates the conductors.

G-E BX is ideal to use for complete wiring systems in small buildings of all types: houses, stores, etc. It is ideal also for wiring leads to factory machines and for extension wiring from conduit. It is available with two conductors, sizes 14 to 2 or with three or four conductors, sizes 14 to 4.

For further information see the nearest Merchandise Distributor or write to Section W-951-8 Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

BUY WAR BONDS AND HOLD THEM

GENERAL ELECTRIC



[NUMBER THREE OF A SERIES]

Standards of Merchandising

TO CREATE new and profitable markets for Electric Door Chimes, Rittenhouse has been developing new sales ideas built upon tried standards of merchandising, for its radically new door chimes soon to be announced.

▸ In association with one of the country's leading marketing research organizations, Rittenhouse devoted several months to procuring practical, up-to-the-minute sales facts for future merchandising plans. This Rittenhouse-sponsored, coast-to-coast survey among wholesalers, dealers and consumers will enable Rittenhouse to provide an array of powerful, hard-hitting, sales promotion factors designed to make Rittenhouse Chimes the fastest-selling, profit line in the country.

Rittenhouse Promotion and Merchandising Plans Include:

1. A *clearly defined* sales procedure for distributors and dealers based upon facts obtained from its national surveys.
2. Famous Norman Bel Geddes chime designs combined with new chime mechanisms *never before available.*
3. *Unexcelled tone richness,* in models to meet every consumer budget.
4. Artistic and compelling Chime Display Boards that will stop prospects on sight. *New in construction—new in display beauty and appeal—new in demonstration effectiveness.*
5. *Expertly created* full-color Window and Counter Displays.
6. Illustrated, color Dealer-Consumer Literature.
7. The largest national magazine and Sunday newspaper magazine advertising support ever put behind the sales promotion of door chimes. And it's *double-barrelled in action!* Big-circulation Sunday Newspaper Magazines for *immediate* sales volume in *heavily populated centers*—plus an imposing group of top-ranking National Magazines to tell the story of Rittenhouse superiority *to millions*—wherever they live.

▸ These *are just a few* of the reasons why it will pay the far-sighted wholesaler and retailer *to Plan Profitably with Rittenhouse.*

Rittenhouse

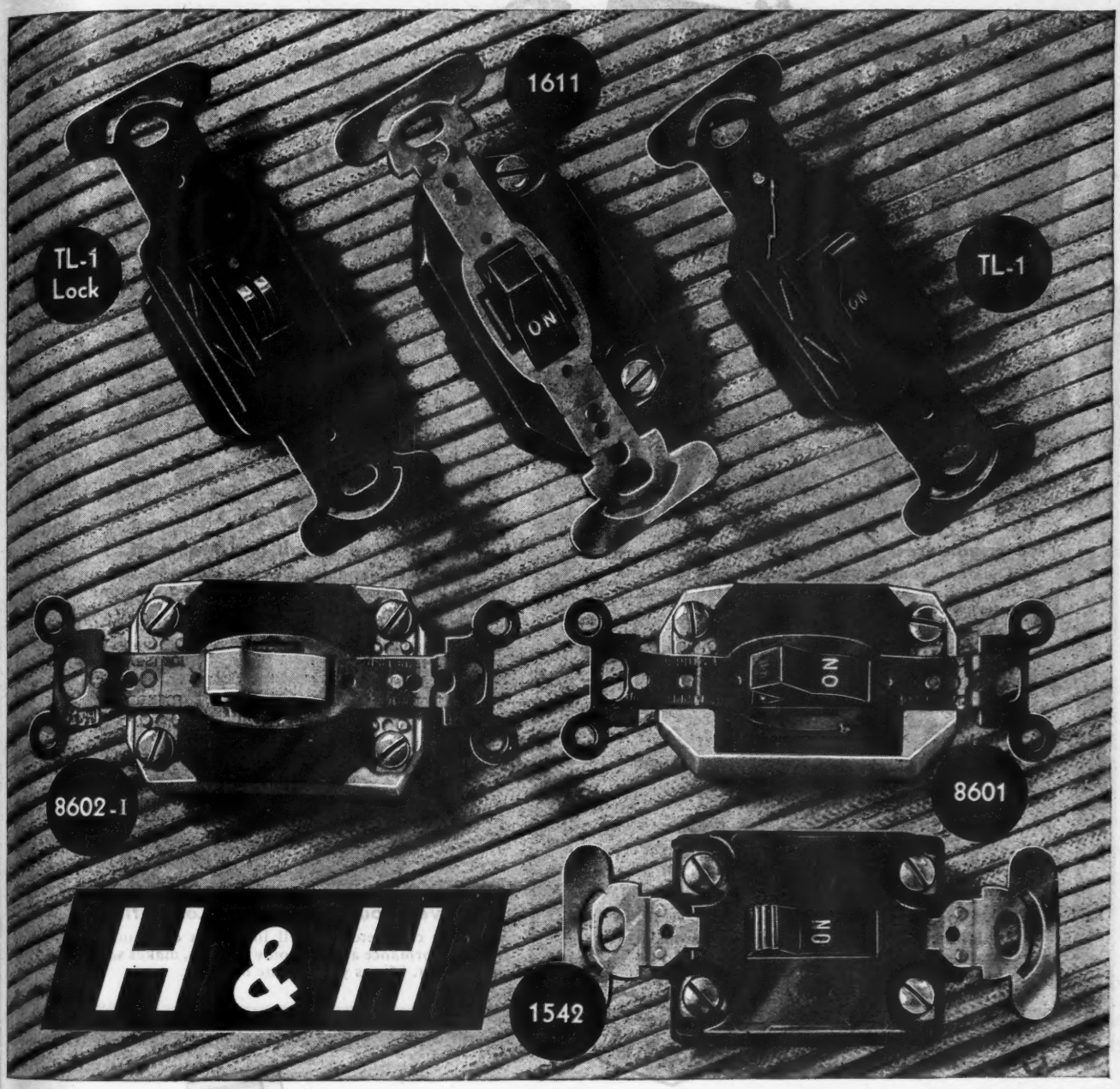
Tomorrow's Better Door Chimes

THE A. E. RITTENHOUSE COMPANY, INC., HONEOYE FALLS, N. Y.

GROUNDING EQUIPMENT

Q. *Several years ago I wired a farm and installed a time switch in the chicken house. The metal cabinet was left ungrounded. The owner received quite a severe shock while adjusting this time switch several months afterward. Since that experience I have grounded the frame of these time switches and all other metal cabinets hung within reach of the concrete or earth floors in farm outbuildings. I recently was given a job in the territory of a different inspector, and he refuses to let me continue grounding these cabinets to the neutral. In many chicken houses moisture is bad during cold weather and even though the job is carefully done it is possible for moisture to gather and form a path for the current. When we are limited to 75 pounds of copper on a farm it hardly seems sensible to make one waste copper by requiring a special conductor installed from the service to ground the metal cabinets. What can we do to save this wire and still keep the job safe?—J.A.G.*

A. The only possible solution apparent is found under paragraph "c" of Section 2556, which reads as follows: "By special permission, other means of grounding fixed equipment may be used." Interim Amendment No. 54 contains the following sentence: "The grounded conductor on the load side of the service disconnecting means shall not be used for grounding equipment, cable armor or metal raceways except as provided in paragraph "c" of Section 2556; in Section 2559 and in Section 3372." Section 2559 refers specifically to the grounding of electric ranges and gives permission to ground to the neutral conductor, and Section 3372 refers to the use of nonmetallic sheathed cable containing an uninsulated conductor. Prior to the grounding of range frames to the neutral conductor there were numerous instances in which housewives were injured or killed and it is apparent that the frequency of such accidents dropped considerably when the frames were grounded to the neutral conductor. This practice is safe only within buildings which are served by well grounded utility distribution systems. The fact that experience with range frame grounding has been very satisfactory may some day bring about more common use of this means of grounding. Inasmuch as the authority enforcing the Code in your area is the only person able to issue the special permission this copper saving issue will have to be decided by him.—G.R.



DEPENDABLE FLUSH SWITCHES

REPRESENTATIVES of leading H & H Lines for residential lighting control. To ask for these numbers is to specify, in sum, the refinements of 55 years of fine switchmaking. . . No. TL-1 Lock — and TL-1 — single-pole on Bakelite base only 7/8″ deep, 1/2″ wide, 1 1/4″ long; designed for "Type C" lamp loads. No. 1611 — single-pole, composition base 1″ deep. No. 8602-I — double-pole with "Ivorylite" handle; porcelain base 1″ deep. No. 8601 — single-pole, porcelain base 1″ deep. No. 1542 — double-pole (20 Ampere), Bakelite base 1 1/2″ deep. Send for Catalog of the *complete lines* these popular numbers typify.

HART AND HEGEMAN DIVISION

DISTRIBUTED THROUGH ELECTRICAL WHOLESALERS

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U.S.A.

MITCHELL INDUSTRIAL LIGHTING



gives you the advantage ... any way you look at it



Engineered for Rugged Durability

The sturdy construction of Mitchell units proves its value in long-lasting service. This means satisfied customers and repeat business.



Easy to Install and Maintain

Simplified design and easy-fit accessories provide for every method of mounting or hanging . . . make servicing quick and easy.



Top Lighting Efficiency

With Mitchell units, you assure your customers finest lighting performance. They're RLM and FLEUR-O-LIER Certified.



Gives You the Edge on Competition

The complete Mitchell line, with outstanding performance and economy features, makes sales easier, brings you volume business.

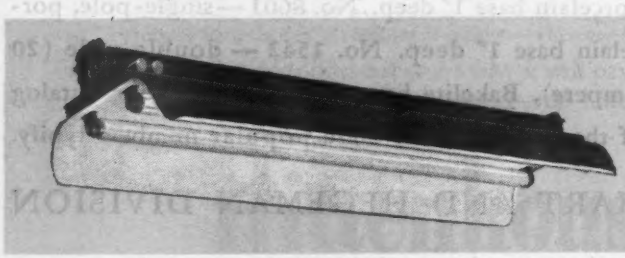
MITCHELL RLM

Mitchell industrial units give you all the lighting features *your customers* seek . . . all the selling advantages *you* want! These all-around benefits are engineered and built into every unit by MITCHELL. They enable you to render greater customer service—make easier sales—get volume business. The complete MITCHELL line of 2-40, 3-40 and 2-100 watt models provides a ready answer for every industrial lighting need.



USE THESE SALES AIDS!

Distribute full-size Catalog No. 281 and Pocket-Size Catalog No. 290. Each tells full story.





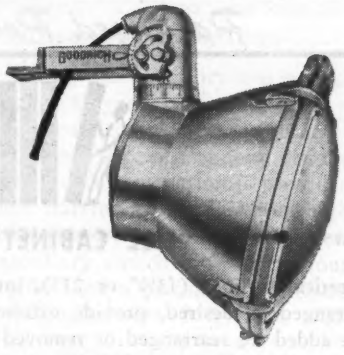
Mitchell Manufacturing Company
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
West Coast Factory and Sales Office: 1019 N. Madison Ave., Los Angeles 27, Cal.

MITCHELL
FIRST IN POPULARITY

THESE ANNOUNCEMENTS of new equipment are necessarily brief—for more detailed description, sizes, prices and other data write to the manufacturers' advertising departments, tell them in what issue of ELECTRICAL CONTRACTING you saw the item and they will send full details to you.

EQUIPMENT NEWS

Floodlight



GOODRICH FLOODLIGHT

A new and improved long range floodlight for illuminating large sports areas, has been announced. New bracket mounting provides calibrated adjustments for accurate positioning of unit both vertically and laterally. When reflector is serviced, it is tipped upwards and back, enabling the serviceman to work from behind on cross arm or platform. When lamp has been replaced or reflector cleaned, the floodlight is returned to the exact calibrated setting so that original focus need never be disturbed. Floodlight is available in either open style or with watertight, heat-resisting glass lens. Used individually or in combination, it can deliver either a narrow or medium beam. Goodrich Electric Company, 4600 Belle Plaine Avenue, Chicago 4, Ill.

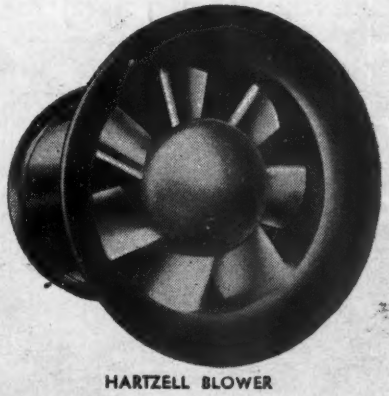
Magnetic Reversing Starter



G-E STARTER

A new a-c magnetic reversing starter, featuring a semi-interference-type mechanical interlock, has been announced. Available in sizes 0 and 1, starter is designed for full voltage starting of squirrel-cage induction motors, although it can be used for reversing service when combined with a reduced voltage starter. The interlock prevents the closing of one contactor while an arc is maintained on the other. The interlock arm of the closing contactor assists the interlock arm of the opening contactor in reaching its fully opened position. Other features are under voltage protection when used with a pushbutton station or other momentary pilot-circuit device; undervoltage release when used with selector or limit switches; and tamperproof, self-contained overload relays. Dust-tight and watertight enclosures are available. General Electric Company, Schenectady, N. Y.

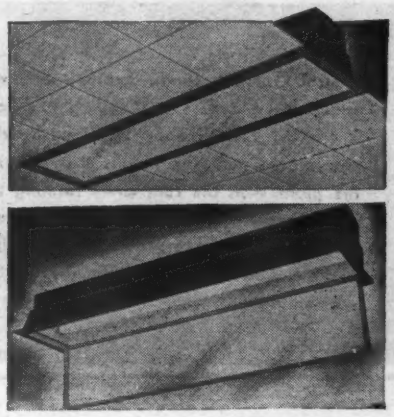
Axial Blower



HARTZELL BLOWER

A new axial flow blower designed to operate against relatively high back pressures at high efficiency is announced. The "Vaneaxial" blower has a one piece aluminum alloy cast impeller and a totally enclosed motor with the vanes designed for straight air flow. The manufacturer claims up to 87 percent efficiency, operation in some sizes against as high as 8 inches water gage back pressure, quiet operation and exceptionally easy installation. The blower is built into a duct section which is installed as a unit. For intake end mounting it is equipped with an entrance bell. A similar design is available with the motor mounted externally. Hartzell Propeller Fan Company, Clark & Downing Streets, Piqua, Ohio.

Fluorescent Fixture



WILEY FIXTURE

This new recessed troffer fixture is designed to fit in a 7-inch space between the true ceiling and the false ceiling into which fixtures are recessed. It is equipped with the E-Z servicer so that glass shield or louver may be opened or removed. Top of reflector is removable so that wiring and ballasts may be reached without taking down the fixture. It is made for both individual installation or continuous runs for two, three or four 40 watt lamps with instant start or starter ballasts. R. & W. Wiley, Inc., 129 Dearborn Street, Buffalo 7, N. Y.

TRUMBULL CONTROL CENTERS

Packaged Power Control



"BUILDING BLOCK" SIMPLICITY

Trumbull Control Centers are not just an assembly of devices, they represent a basic wiring system wherein main bus bars and standardized control units are assembled in individual sections.

These standardized, enclosed units, composed not only of feeder circuit controls but also magnetic combination starters, Sizes 1, 2, 3, or 4, for control of power or lighting feeder circuits, are plugged into prefabricated, standardized vertical sections containing bus bars.



"FILE CABINET" EASE

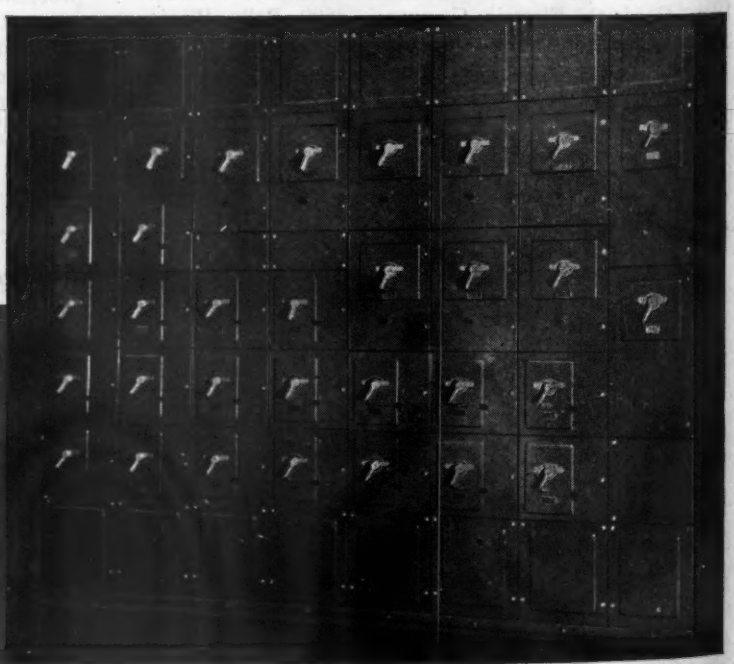
Vertical sections (13½" or 27"), into which control units are arranged as desired, provide extreme flexibility—sections may be added to, rearranged or removed to meet changing requirements. Sections or units of control centers may be shut down, or worked upon without interfering with adjacent units.

Contrast this method of installation with the usual practice of installing a "custom-built" switchboard mounted on skids and most frequently shipped as a single unit of large bulk and weight.



"PLUG-IN" ASSEMBLY

With vertical sections in place, control units used in the 13½" wide sections are quickly plugged in from the front after completion of construction work and wiring. Individual units may be removed, changed and inserted at will for inspection or maintenance purposes.



Typical Trumbull control center—with starter control combination units for 50 H. P. and less (Sizes 1, 2 and 3). "Start" and "Stop" push-button stations are located near the motors themselves throughout the plant with the controllers forming this compact control center—centrally located away from industrial congestion and unfavorable atmospheric conditions. Entire line illustrated and described in Bulletin 411, sent on request.

THE TRUMBULL ELECTRIC MANUFACTURING CO.

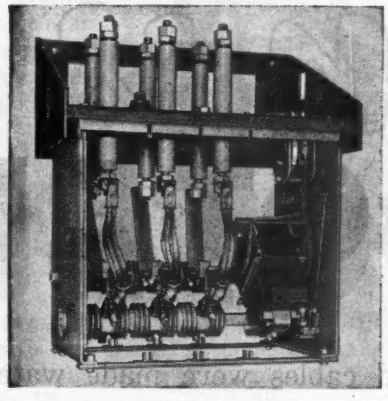
PLAINVILLE, CONNECTICUT

OTHER FACTORIES

NORWOOD (CINN.) OHIO — SEATTLE

SAN FRANCISCO — LOS ANGELES

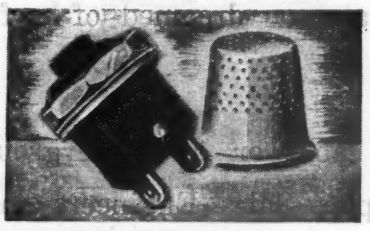
Oil-Immersed Contactor



ALLIS-CHALMERS CONTACTOR

This new type "MO" oil-impersed contactor is designed for heavy-duty motor starting service in industrial plants. It is built in 100 and 200 amp. sizes, and can be used with motors rated up to 900 hp. at 2300 volts. The manufacturer claims that the new steel frame construction of this clapper type contactor ensures greater rigidity and perfect alignment of parts. It has an E-type magnet and an a-c coil with armature directly connected to the contactor shaft through a universal joint. Arcing is done on the tips, not on current-carrying areas. Insulation is provided by wide pole spacing, plus barriers, and Bakelain high dielectric bushings. Accessories available with the new contactor are a built-in auxiliary switch with up to four normally open or closed poles and a permanent windless type tank mechanism. Allis-Chalmers Mfg. Co., 559, Milwaukee 1, Wis.

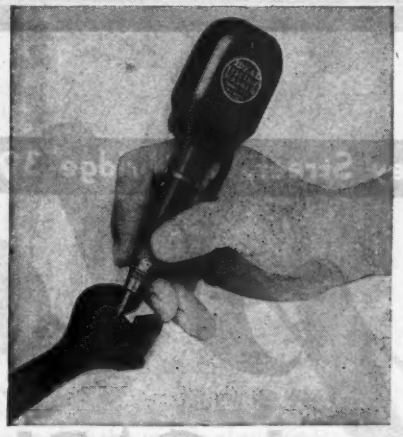
Snap Switch



HETHERINGTON SWITCH

This small snap switch, known as Junior, can be furnished normally-open, normally-closed, two circuits or single-pole double-throw. It is 9/16-inch in diameter and 31/32-inch in length. It is complete in itself but can also be furnished with special over-travel adapters and special mounting sockets. It is supplied with a nut and lock-washer. Switch is rated at 15 amperes, 110 volts a-c. Robert Hetherington & Son, Inc., Sharon Hill, Pa.

Electric Marker



IDEAL ELECTRIC MARKER

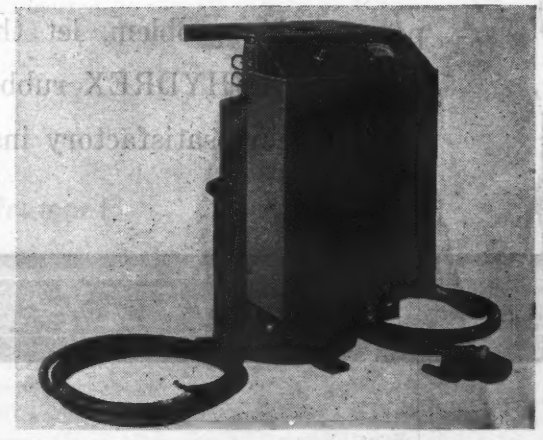
A new electric marker, which is small in size—6 inches long and 10 ounces in weight—has been announced. Shaped to fit the hand, it can be held and used to write as a pencil. It marks iron, steel, bronze, aluminum, ceramics, tile, marble, lead, plastics, porcelain, glass, etc. Marker operates from any a-c electrical outlet. Operating like a small electric hammer, it makes 7200 cutting strokes per minute. Permanently marks sizes, names, numbers and other information on tools, parts and finished products. All parts are enclosed. For average marking, a hardened alloy point is furnished as standard. If extra hard materials from 54 up to 64 Rockwell hardness Scale C are to be marked, a diamond point is recommended. Ideal Commutator Dresser Company, 1041 Park Avenue, Sycamore, Ill.



FOSTORIA INFRA-RED UNIT

Portable Infra-red Unit

Three new portable infra-red units have been announced. Model 60-200 is equipped with a clamp base, and may be mounted either singly or in multiple pairs to wood or metal framework. It is flexible at three points—where the base connects with the lower arm; in the middle of the double arm; where the upper arm connects to the reflector housing. Overall length from mounting surface to edge of reflector is 40 5/16 inches. The clamp will fit on pipes of round or square stock up to two inches and/or other surfaces up to 2½ inches thick. These models may be used for various applications including baking, drying, preheating, etc. The Fostoria Pressed Steel Corporation, Fostoria, Ohio.



ELECTRIC PRODUCTS CHARGER

Battery Chargers

Two new battery chargers have been announced. They are designed to enable the industrial truck operator to charge his own batteries in the work area. The E.P. single circuit charger is for charging one battery at a time; the E.P. four circuit charger is for charging one to four batteries at a time. Automatically, the charging current begins at the proper value; the charging current is controlled throughout the charge; the equipment shuts down in case of power failure; when power is restored, charging resumes; and the charger shuts down completely when the battery is charged fully. The Electric Products Co., Clarkstone Road, Cleveland 12, Ohio.

Water is a SABOTEUR

Ever since the first insulated cables were made water has been the arch-enemy of dependable operation. Before the war Simplex developed and produced Simplex-ANHYDREX deproteinized rubber insulation. Now Simplex has developed a new ANHYDREX insulation made from specially treated and compounded Buna rubber.

This new ANHYDREX insulation has a water absorption rate of only 20 milligrams per square inch of exposed surface. That is far ahead of anything that was dreamed of a few years ago with synthetic rubber.

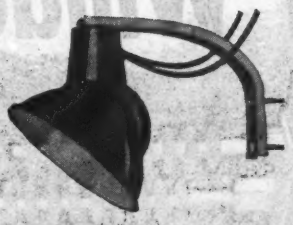
If you have a submarine cable or an underground power cable problem, let the Simplex Sales Engineers show you how ANHYDREX rubber insulation can save money and make a more satisfactory installation for you.



Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex WIRES and CABLES

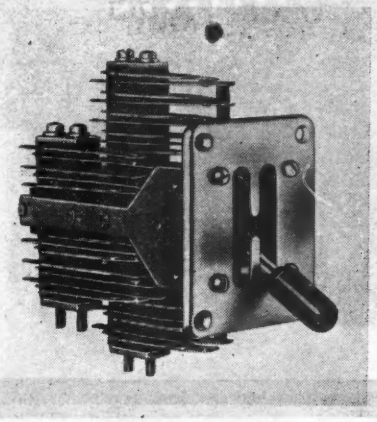
Angle Bracket-Reflector



QUADRANGLE REFLECTOR

This shallow bowl bracket reflector is for use on or near living quarters. The angle reflector bracket shields windows from undesired light, at the same time providing a broad flood of light wherever wanted. Angle units should also be used for the illumination of roadways from the side, in order to avoid spilling light into nearby fields. Mounted on the wall of a building, these units direct the light outward and downward rather than against the wall. They come complete with steel bracket wire and mounting screws. Quadrangle Manufacturing Company, 32 So. Peoria Street, Chicago, Ill.

Lever Switch



MOSSMAN SWITCH

A new Series 450C heavy duty lever switch known as "Gear Shift Switch" has been added to this line. This Series is available in either a four position or a five position switch. In all positions, except center, the action may be locking or non-locking. In center position it is always locking. The action may be changed at any time by selecting the proper stop plate. Some of the applications for this Series is safety selective switching; emergency transfer of spare equipment, equalization of multi-generator operation, hoist control, crane control, motor starting, stopping, and reversing. Donald P. Mossman, Inc., 612 North Michigan Avenue, Chicago 11, Ill.

Local Lighting

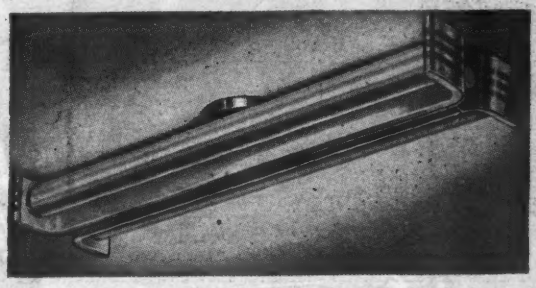


SWIVELIER WORK-LITE

An improved type of Work-Lite for attachment to machine tools, assembly benches, desks, etc. has been announced. This unit comes with Greenfield cable and leads for direct attachment to outlet box or transformer, thus grounding the entire unit. It is available with arms from 12 to 30 inches long; cone, bell, parabola or acorn shades; and with or without removable glass lens, frosted, clear or daylight. It has the adjustable spring-construction Swivelier socket. The entire arm of the unit is also universally adjustable in the base. Swivelier Company, 30 Irving Place, New York 3, N. Y.

Fluorescent Kitchen Unit

This new fluorescent lighting unit, known as the "Kitchener," is designed primarily for the kitchen but it is adaptable to many other rooms. All parts are easily accessible. The starters are not under the bulbs, but on the ends of the channel. The fixture is finished in white supercoat baked enamel, with polished trim and end caps. It uses two 20 watt lamps. A. L. Smith Iron Company, Chelsea 50, Mass.



SMITH KITCHENER

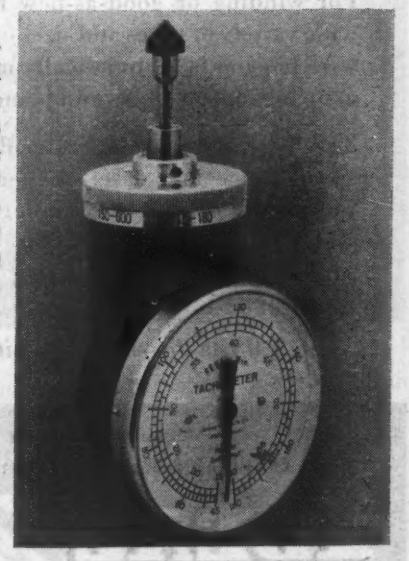
Fluorescent Lampholder



LLOYD LAMPHOLDER

A new fluorescent lampholder, called "Flex-Loc," has been announced. The holder is flexible, adjusting automatically to variations in length of lamps and spacing of mounting holes in reflector units. It has a positive automatic lock which prevents lamp from falling out, or contacts from loosening, due to vibration or shock. The newly designed, patented contacts grip both sides of lamp pins. Flex-Loc is engineered to fit all standard spacings. Lloyd Products Company, Providence, R. I.

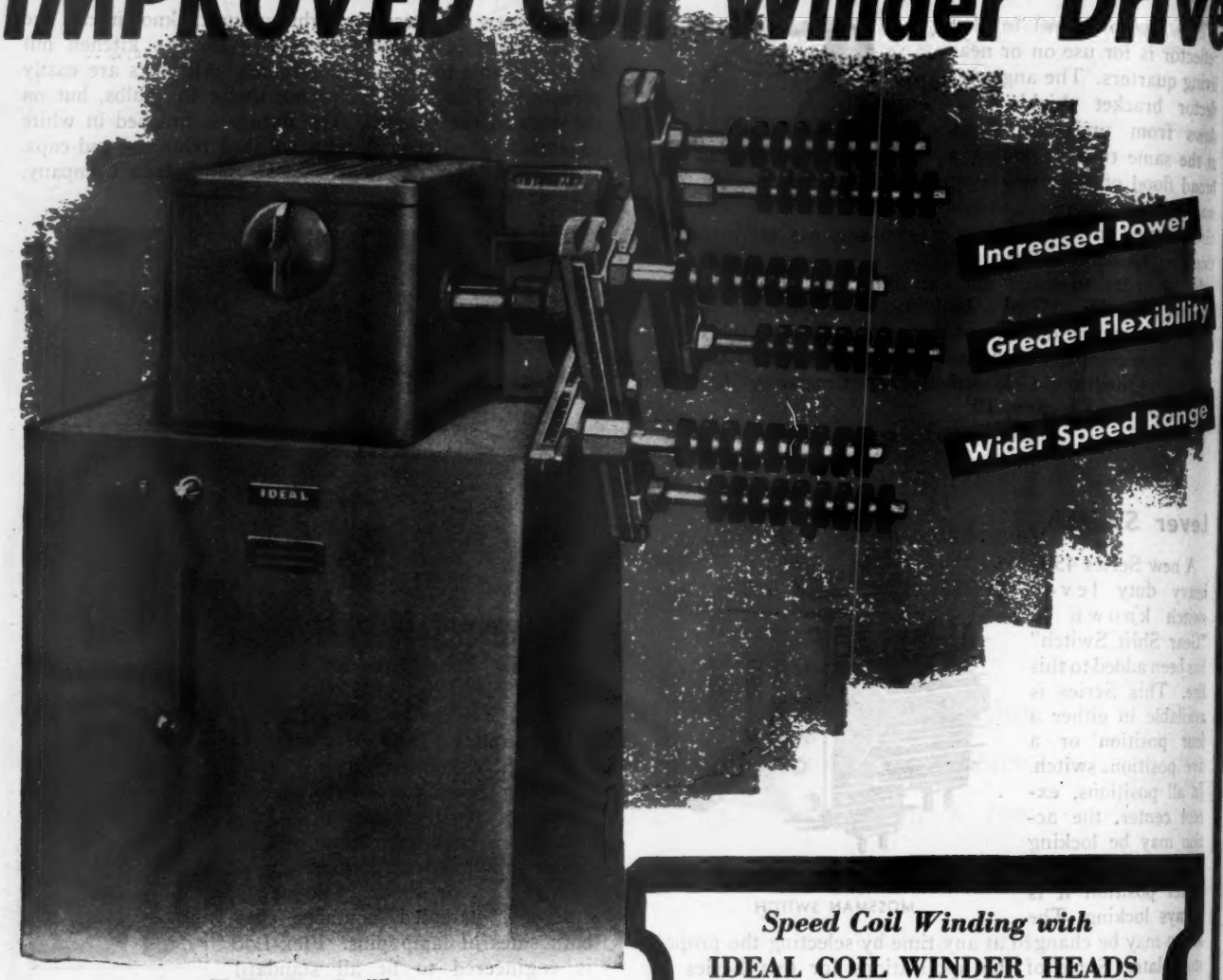
Instrument



BIDDLE TACHOMETER

A new precision direct-indicating hand tachometer has been announced. It has two scales and five different ranges—45 to 180 rpm; 150 to 600 rpm; 450 to 1800 rpm; 1500 to 6000 rpm; and 4500 to 18000 rpm. Change of range is by rotation of knurled barrel head. Instrument is supplied with carrying case and accessories, including a six-inch circumference wheel for measuring surface speeds. James G. Biddle Co., 1211 Arch Street, Philadelphia 7, Pa.

IMPROVED Coil Winder Drive



IDEAL
New "Heavy-Duty"
COIL WINDER DRIVE

For winding or good-as-new re-winding of a wide variety of types and sizes of coils. Constant wire tension is automatically maintained, thus assuring uniformly-wound and perfect coils.

The increased power, greater flexibility, wider speed range and ease of operation give this improved IDEAL Coil Winder Drive a much wider range than ever before—speed is infinitely variable between the "Hi" and "Lo" speed of 41 to 410 RPM.

Write for Detailed Literature

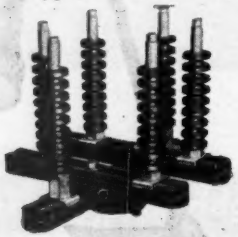
Machinery Products Division
IDEAL COMMUTATOR DRESSER CO., 1041 Park Ave., Sycamore, Ill.

IDEAL Sycamore

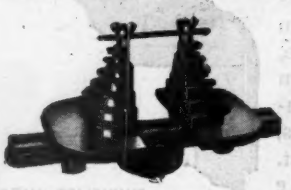
Branch Offices in Principal Cities — Consult Your Local Telephone Book

Speed Coil Winding with
IDEAL COIL WINDER HEADS

Adjustable for winding many types and sizes of coils. One IDEAL Head eliminates building and storing of numerous sizes of wooden frames which require a large amount of storage space and which split, warp and wear out. These IDEAL Coil Winder Heads are easily set up and pay for themselves quickly. For use with all types of coils and armatures.



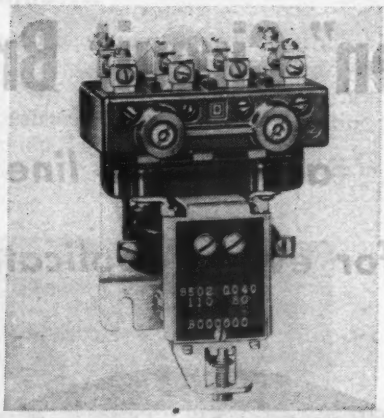
IDEAL "Universal" Model
Winds perfect coils in sizes ranging from 3⅛" x 6½" up to 13" x 16½". Wound from one continuous wire—no soldering.



IDEAL
"Concentric" Model
For winding field coils of single phase motors. Coils may be wound in gangs or groups up to six with all coils connected in series. Entire group of coils may be removed at one time.

Complete Line Of Coil Winder Heads
To Meet All Needs
PROMPT DELIVERY

Contactor



SQUARE D CONTACTOR

The new Size 00 contactors have convertible contacts, easily changed from normally open to normally closed without additional parts. All terminals have provision for two wiring clips. These Type Q contactors are suitable for mounting on steel panels. They are available with two to six poles in any combination of normally open and normally closed contacts. Ratings are 600 volts a-c maximum; 10 amperes open, 9 amperes closed. Square D Company, 4041 N. Richards Street, Milwaukee 12, Wis.

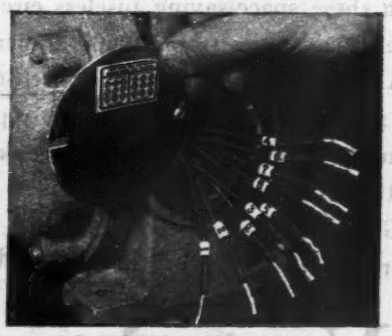
Control Devices



PAUL HENRY CAM-STAT

The Cam-Stat controls are used for temperature, pressure, humidity and mechanical displacement. They are adjustable over a wide range and are furnished with operating differentials running down to as low as 1° F. Some of the features are double break contacts; applicable range from minus 100° F to plus 600° F; enclosed contacts; single pole single throw, single pole double throw or independent circuit double throw; low thermal lag; tamper proof; adaptable to any mounting means. Model C thermostat is rated at 10 amps., 115 volt a-c or 28 volt d-c. The Paul Henry Company, Thermal Division, 2037 South La Cienega Blvd., Los Angeles 34, Calif.

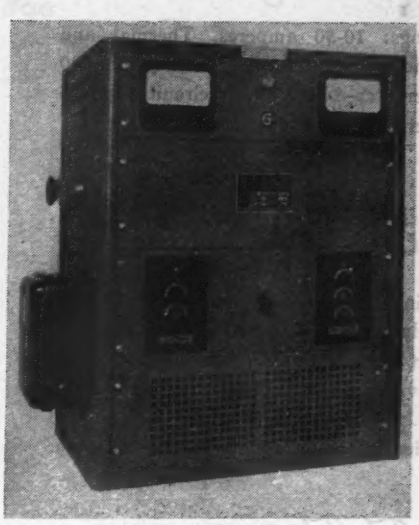
Wire Markers



E—Z CODE WIRE MARKERS

The E-Z code wire marker has been developed so that coding of electric motor leads and other electrical apparatus can be made at the time of disconnecting. Since many electric motors carry nine leads, there is a card containing 27 codes, three of each number, of the numerals one to nine. The wire markers are made of flexible, waterproof material, pre-cut so that they can be peeled from the card, ready to apply. Western Lithograph Company, Los Angeles, Calif.

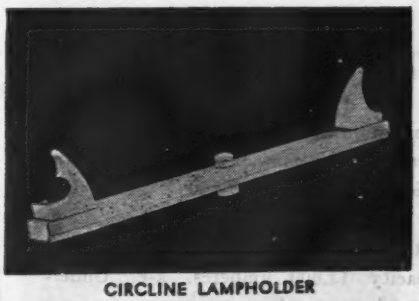
Rectifier



GREEN RECTIFIER

This rectifier has stabilized low voltage high current output. The unit is rated at 200 amperes, voltage range zero to three volts. Any voltage selected in range is maintained to within 50 millivolts over load variation from zero to 200 amperes, and with line voltage variation of plus or minus ten percent. Voltage stabilization system includes motor driven Powerstat and electronic pilot device. Principle is applicable to larger or smaller rectifier units. Green Electric Co., 130 Cedar Street, New York, N. Y.

Fluorescent Lampholders



CIRCLINE LAMPHOLDER



SLIMLINE LAMPHOLDER

The new lampholder for slimline and circline fluorescent lamps have been announced. The slimline lampholder is designed for use in general lighting fixtures. The circline lampholder is for fixtures and portable lamps in commercial and industrial installations. The slimline are of the medium, single-pin type for multiple service only. They accommodate the T8 and T6 lamps. Lampholders can be mounted to any flat service and spaced on two inch center minimum. Binding screws are located in the base. The circline accommodates 12 inch circline fluorescent lamps. This holder provides electrical connections, positions the lamp and supports it at two points. One point has the electrical connections and the other provides the necessary tension to hold the lamp securely. The simplified design permits mounting in the conventional way. General Electric Company, Bridgeport 2, Conn.

AB
"De-ion" Circuit Breakers

a complete line

for every application

★*Quicklag* 1-POLE

Ratings: 10-50 amperes. Thermal and magnetic trip. Safely interrupts 5,000 amperes, a-c on short circuit. Underwriters' approved for 125 volts, a-c.

★*E-Frame* 1, 2, 3-POLE

Ratings: 10-50 amperes. Thermal trip. Safely interrupts 5,000 amperes, a-c on short circuit. Underwriters' approved for 250 volts, a-c or 125/250 volts, d-c. Fifteen and 20-ampere single-pole ratings are Underwriters' approved for 277 volts, a-c.

★*F-Frame* 2, 3-POLE

Ratings: 15-100 amperes. For 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Thermal and magnetic trip. Universal mounting characteristics. Underwriters' approved. Safely interrupts 15,000 amperes.

★*G-Frame* 2, 3-POLE

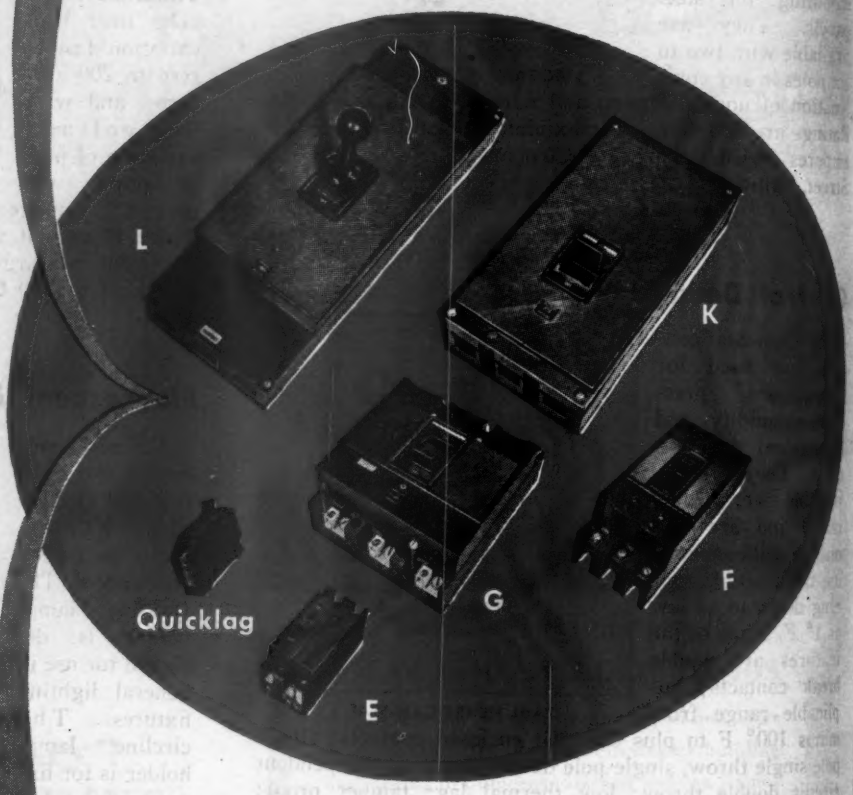
Companion to F Frame with thermal and *interchangeable* as well as *adjustable* magnetic trip. Ratings: 35-100 amperes. For 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Interrupting capacity 15,000 amperes, a-c. Underwriters' approved.

★*K-Frame* 2, 3-POLE

Thermal and magnetic trip with interchangeable trip. Ratings: 70-225 amperes. Underwriters' approved for 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Interrupts 15,000 amperes, a-c.

★*L-Frame* 2, 3-POLE

Ratings: 125-600 amperes. Underwriters' approved for 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Interrupts 25,000 amperes, a-c. Thermal and magnetic trip with interchangeable trip units.



Cut machine-hour losses with these Westinghouse AB "De-ion" Circuit Breakers. With them, power is not interrupted for harmless, momentary overloads. Service is restored swiftly and with ease when a circuit fault has been cleared. Every industrial requirement is met with these space-saving fuseless circuit breakers, available in capacities from 10-600 amperes.

AB Breakers are completely self-enclosed and sealed for safety. There are no parts to repair or replace. The "Quick-Make" and "Quick-Break" mechanism is a feature of every one.

Get complete information from your Westinghouse representative or write the nearest Westinghouse office.

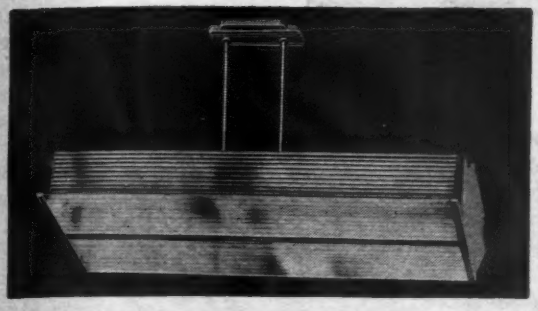
J-60613

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Fluorescent Luminaire

The new A-3440 Permaflector fluorescent luminaire has been announced. It is the shielded type using four 40 watt fluorescent lamps. Satinol finished contrasting glass panels are easily removable for maintenance. Mounting may be individual, continuous, direct ceiling or suspension. Pittsburgh Reflector Company, Oliver Building, Pittsburgh 22, Pa.



PERMAFLECTOR UNIT

Burnisher



OHIO CARBON BURNISHER

These burnishers are for use on commutators or rings. They are made of non-conductive materials that can be used on a live machine. Styles for all sizes of commutators and rings ranging from flea to heavy duty horsepower are available. The burnisher is held against the commutator until the film or glaze is removed. There is no dusting, and slots do not fill up. The pencil type is designed for use on small motors. Full size is six inches long with burnishing material at both ends. The Ohio Carbon Company, 12508 Berea Road, Cleveland, Ohio.

Portable Floodlight

This portable floodlight is for use in airports, shops, warehouses and other auxiliary lighting needs. Its base is of sufficient weight to prevent tipping. The standard can be any height from floor, or the floodlight can be mounted directly onto the pedestal base. It is made in three sizes with plain, ribbed or stippled lenses, to accommodate 150-200 watt 300-500 watt or 750-1000 watt lamps. It can also be had without lens. Clamp type or hinged type lens covers are available. Unit can also be had with focusing mechanism or with fixed focus. Reflector housing is constructed of spun sheet aluminum. The neck and socket housing is cast aluminum. Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill.



REVERE FLOODLIGHT

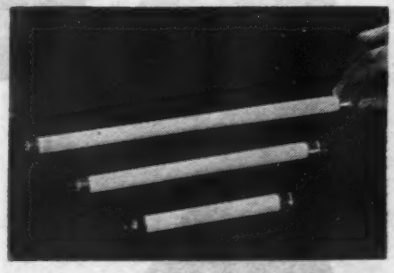
Lineman's Bridge



NILSSON INSTRUMENT

This bridge was built to meet the requirements of the telephone and telegraph lineman but can also be used as a general-purpose bridge up to the limit of its capacity. It is used to measure the resistance of wires as well as the unbalance between two wires. The reading on the loop can be changed to the unbalance reading without disturbing the connections. The switching arrangement also designates which wire is of the higher resistance. Batteries are standard 1½ volt flashlight cells. Instrument measures 9 by 5 by 4½ inches and weighs five pounds. Nilsson Electrical Laboratory, 103 Lafayette Street, New York 13D, N. Y.

Fluorescent Lamps



SYLVANIA FLUORESCENT LAMPS

Miniature fluorescent lamps designed for instrument lighting, displays, small portable lamps, domestic night lights and many applications of built-in localized lighting have been announced. The new T-5 lamps are supplied in 6, 9, and 12 inch lengths rated at 4, 6 and 8 watts respectively, for 110-125 volt a-c operation. Equipped with standard miniature bipin bases for convenient mounting in miniature lamp holders, they may be operated with suitable ballast and starter or pushbutton. Sylvania Electric Products, Inc., Salem, Mass.

Electrical Insulating Board

Durok is a 100 percent non-cotton cellulose electrical insulating board. Dielectric strength ranges from 400 to 600 volts per mil. Methanol and naphtha extractables are .02 to .12 percent and .02 to .08 percent, respectively. Because of absence of chemical treatment or sizing, the new Durok is neutral, has good heat-aging characteristics, dries out with a shorter baking cycle and absorbs insulating varnish. Stock sheet sizes are 36 by 48 inches and 36 by 24 inches, with the grain direction parallel to the second dimension. Thicknesses now available are .015, .020, .025 and .030 inches. Rogers Corporation, 13 Mill Street, Manchester, Conn.

Special formulations FOR SPECIFIC NEEDS!



Fibron

PLASTIC TUBINGS AND TAPE

Users of flexible plastic tubings and tape secure a large increment of efficiency and economy when they specify "Fibron by Irvington." For the product they receive has been especially formulated for their own specific need. Should the *major* requirement be operation at elevated temperatures, a Fibron formulation for exactly that job can be supplied. Likewise for temperatures as low as —70° F; or for services requiring resistance to acids, alkalis, corrosive fumes, and abrasion. In each case the correct Fibron formulation is supplied. Each formulation of course, furnishes the high electrical and mechanical properties essential for efficient, long lasting insulation.

It is this Irvington policy of "*engineering* and *formulating* for specific applications," that accounts for the long service which Fibron plastic products provide . . . as well as for Irvington's continuing leadership in electrical insulation!

Fibron plastic tubings are produced in all standard opaque colors as well as transparent — diameters from .034" to 2" — in coils or cut lengths. Fibron tapes are obtainable in black and clear, in widths ½" to 3", thicknesses .004" to .030" and in convenient length rolls for hand application. Fibron wire markers are available plain or stamped, in inside diameters from .053" to ½".

An outline of *your* special requirements will receive immediate attention. Write Dept. 96.

STANDARD OF THE WORLD — IRVINGTON INSULATION

IRVINGTON
VARNISH & INSULATOR CO.
Irvington 11, New Jersey, U. S. A.

"LOOK TO IRVINGTON FOR CONTINUED LEADERSHIP IN INSULATION"

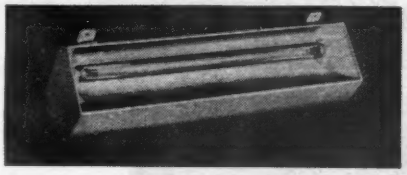
Connectors



BURNDY CONNECTOR

Hydent electrical connectors for small size aluminum wires and cables have been announced. Zinc is plated on oxide-free aluminum on these connectors, prohibiting reformation of the oxide film once it has been removed, and providing the connector with a low-resistance contact surface. The barrel of each connector is then filled with petroleum jelly in which zinc dust is suspended. Thus, when the cable end is inserted into the zinc-filled barrel, zinc compound is forced in between the individual strands. Then as the connector is indented to the cable with the Hytool, the zinc particles tend to break through the oxide film on each strand as the wires are forced to rearrange themselves and wipe against one another under the pressure of the indenting tool. These connectors are available for the complete range of aircraft electrical conductor sizes. Burndy Engineering Co., 107 Bruckner Blvd., New York 54, N. Y.

Housing Unit of Germicidal Lamps


FEDCO HOUSING UNIT

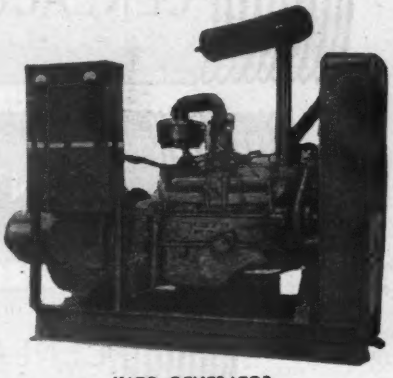
The principle of the new and improved Fedco housing of Mazda germicidal lamps is to flood the area above the seven foot level in a room with the germ-killing ultra-violet rays. The natural thermal air currents within the room continually carry the bacteria-laden air to the irradiated zone where the germs are destroyed. It is available in two standard sizes—15 and 30 watt; 110 volt 60 cycle for a-c only. There are two types of fixtures, one for portable use and one for permanent mounting, in any color specified, to fit any type of room. Federal Engineering Company, 37 Murray Street, New York, N. Y.

Fluorescent Unit


PITTSBURGH LIGHTING UNIT

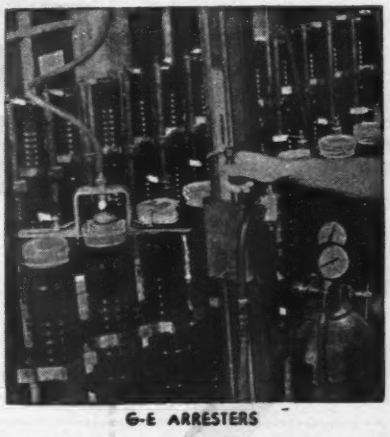
This new fluorescent lighting fixture, known as the Jefferson, is for commercial use. It uses two 40 watt, T-12 fluorescent lamps It operates on 110-125 volt, 60 cycle a-c or 220-250 volt, 60 cycle a-c. Units are available for surface or suspension mounting or in continuous row. Side panels are curved Skytex glass, Satinol finish. Reflecting surfaces are sprayed, heat-resistant, baked-on enamel. Ends, outside surfaces and baffles sprayed and baked-on metallic silver finish. Pittsburgh Reflector Company, Pittsburgh, Pa.

Generator


KATO GENERATOR

A new 15,000 watt Katolight plant has been added to this line of generators. It is model 52-MPK6, operates on 120/208 volts, a-c, 60 cycle, 3 phase, 4 wire, 1200 rpm., revolving field type generator. It is powered by model T-118 Chrysler's six cylinder four cycle watercooled engine. The dimensions are 70 inches long by 49¼ inches high by 24⅜ inches wide. The unit can be furnished with weatherproof housing. It can be used for farms, resorts, trailers, hatcheries, construction work for continuous duty or stand-by service in case of power line failure. Kato Engineering Company, Mankato, Minn.

Lightning Arresters


G-E ARRESTERS

Pellet-type lightning arresters for the protection of apparatus on distribution circuits 15,000 volts and below, now have a separately sealed, nitrogen-filled gap chamber. In order to eliminate the recognized adverse effects of internal condensation caused by changes in outdoor temperature, all air and atmospheric moisture are evacuated from the gap chamber.

Calculator

This new parallel-resistance and series-capacitance calculator is designed to provide a rapid and accurate means of determining the reciprocal of the sum of two reciprocals as expressed by the formula $1/x = 1/a + 1/b$. A single setting of the slide automatically aligns all pairs of a and b values which will satisfy the equation for any given value of x. This calculator indicates in one setting the numerous pairs of resistances which may be connected in parallel, or capacitances in series, to provide any required resistance or capacitance value. Range: 1 ohm to 10 megohms; 10 mmfd. to 10 mfd. Allied Radio Corp., 833 West Jackson Blvd., Chicago 7, Ill.



QUALITY

CENTRAL RIGID STEEL CONDUIT

"There's Tested Strength in Every Length"

SPANG-CHALFANT

Division of The National Supply Company

General Sales Office: Grant Bldg., Pittsburgh 30, Pa.

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ELECTRIC TIMER

1 Bulletin No. 1100 describes table and wall model stop clocks, precision chronoscopes, combination timers and impulse counters, stop watch controllers, and spring wound X-ray timers. C. H. Stoelting Company.

MICA TRIMMERS

2 A 12-page catalog listing and illustrating all standard types of automatic mica trimmers. Specifications are given for each type including capacity curves and outline drawings showing dimensions. Automatic Manufacturing Corp.

LIGHTING EQUIPMENT

3 Catalog No. 45, consists of 28 pages of engineering details for the layout of incandescent and fluorescent lighting equipment for offices, drafting rooms, schools and stores. The F. W. Wakefield Brass Co.

ELECTRONIC HEATERS

4 Bulletin B6372 illustrates and describes vacuum tube electronic heaters for both induction heating of metals and dielectric heating of nonmetallic materials. Allis-Chalmers Mfg. Co.

LIGHTING FIXTURES

5 Bulletin 10-B illustrates and describes the "Topnotch" and "Viz-Aid" fluorescent lighting fixtures. Day-Brite Lighting, Inc.

CABLE VULCANIZER

6 Bulletins RV-104 and RV-104K features cable vulcanizers and kit. Mold specifications, dimensions and many illustrations of various types are given. Mines Equipment Company.

FARM WIRING GUIDE

7 A new 56-page book for planning wiring for practically any farm. It considers wiring layouts for entire farms describing the entrance wiring needed, farmyard wiring, the wiring for barns, machine shops, hog houses, sheep sheds, and farm residences. The number of circuits are given and recommendations are made for placing lighting outlets, convenience outlets and switches. Many illustrations, charts, and diagrams are used. General Electric Co.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

8 A 16-page folder (GU-86) describes this entire line of electrical and automotive products—motors, transformers, industrial brakes and controls, hydraulic brakes, air brakes, tachographs, NoRoL, brake lining, and brake-service tools. Wagner Electric Corp.

GERMICIDAL LAMPS

9 Folder 798 covers the use of germicidal lamps in the poultry, meat, cheese and dairy industries. The Edwin F. Guth Company.

FANS AND BLOWERS

10 Bulletin 1601, consisting of 12 pages, illustrates and describes fans and blowers—the Tubeaxial and Vaneaxial models. Hartzell Propeller Fan Company.

ELECTRONIC CONTROLS

11 Catalog Z-6300, consisting of 12 pages, describes the electronic principle by which control is effected without contact between measuring and control units of an instrument and gives descriptions and prices of its equipment. Wheelco Instruments Co.

TESTING INSTRUMENT

12 A 20-page booklet telling the story of the traction type dynamometer and the many uses for it in simplifying testing and weighing procedures in industry. W. C. Dillon & Company, Inc.

ELECTRONICS

13 A 20-page booklet entitled "Introduction to Electronics" gives the principles of electronics and an idea of the part electronics will play in future industrial developments. Allis-Chalmers Mfg. Co.

TELEVISION

14 Publication EBT 28-A on "Infra-Tel Systems" describes a television system for use by department stores. General Electric Co.

GREASE LUBRICATION

15 Instruction Sheet No. 3042 covering the grease lubrication of anti-friction bearings in Reliance a-c and d-c motors, V-S drives and m-g sets. Reliance Electric & Engineering Co.

DIRECTORY OF PRODUCTS

16 A revised directory listing more than 1600 product types and

Circle numbers, sign and paste on your letterhead and mail in an envelope.

ELECTRICAL CONTRACTING September
330 West 42nd St.
New York, 18, N. Y. (Not good after November 1)

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
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57	58	59	60	61	62	63	64	65	66	67			

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COMPANY .....

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engineering literature describing the lines of equipment furnished by A-C to many industries. Allis-Chalmers Mfg. Co.

MAGNETS

17 Bulletin CEA-3682B illustrates sintered-alnico magnets for control devices, motors, meters and instruments, wiring devices, appliances, etc. General Electric Co.

INSTRUMENT CONTROL BOARDS

18 Catalog No. 119 illustrates a number of panel and cubicle installations constructed from standard units. It also shows custom built assemblies made to individual specifications. Falstrom Company.

REEL HOLDER

19 A folder illustrating and describing the Roll-A-Reel to handle heavy reels, either single reels up to 28 inches or 48 inches wide or two reels up to 24 inches in width. Roll-A-Reel.

ROTARY EQUIPMENT

20 Sales Bulletin No. 445 features dynamotors, magmotors, generators, converters and hand generators for many radio and electronic applications. Carter Motor Company.

STORAGE BATTERY

21 A folder describing and illustrating the rechargeable flashlight storage battery. Ideal Commutator Dresser Company.

ELECTRICAL LIVING

22 Booklet B-3602 entitled "Better Living Means Electrical Living" is designed to help consumers plan ahead so that electrical equipment can be added without rewiring. Westinghouse Electric Corp.

FARM BOOK

23 A 52-page book entitled "Putting Electricity to Work on Your Farm." It shows how electricity can be used to increase profit and offset the manpower shortage. Westinghouse Electric Corporation.

REINFORCED BUS STRUCTURE

24 Publication No. 4504 describes and pictures reinforced high voltage bus structures to withstand short circuit stresses where currents of several hundred thousand amperes are a possibility. Delta-Star Electric Co.

TERMINAL BLOCKS

25 A booklet describing ten styles of Controlead terminal blocks used as junction point in any control wiring installation. Cross section views, dimensions and prices are given. T. B. Burke Electric Company.

TEST INSTRUMENTS

26 A folder illustrating and describing multi-range, multi-purpose test instruments. The line includes test-

ing sets for servicing electronic equipment, testers for laboratory, manufacturing, and maintenance test requirements. Weston Electrical Instrument Corp.

LOAD RATIO CONTROL

27 Bulletin B6174 describes a voltage regulator for use on power transformers to change taps without interrupting the load and to keep line voltage at proper level. Allis-Chalmers Mfg. Co.

TRANSFORMERS

28 Bulletin No. S-402, consisting of 20 pages illustrates and describes power transformers. The Standard Transformer Co.

RADIO MASTS AND TOWERS

29 A 24-page catalog entitled "Easy to Erect" radio masts and towers. Description is given and many illustrations shown. Harco Steel Construction Co.

INFRA-RED OVENS

30 A pamphlet illustrating and describing the Raymersion prefabricated infra-red ovens. The Trumbull Electric Manufacturing Co.

LIGHTING PRODUCTS

31 A new lighting products booklet containing information about industrial, commercial, portable and inspection type of fluorescent fixtures; lamps, starters and lampholders. Sylvania Electric Products Inc.

MOTOR SELECTOR GUIDE

32 A booklet to provide design engineers and production executives with a step-by-step method for selecting correct type and size of fractional horsepower motor for any application. The Dumore Company.

VARNISHES

33 A booklet describing the properties of DC 993 varnish and outlining the recommended procedure in applying this Silicone product to the insulation of electrical equipment. Dow Corning Corporation.

MERCURY ARC CONVERTERS

34 Bulletin B6373 gives information on standard mercury arc converters designed for induction heating operations in the 500 to 2000 cycle frequency range. Allis-Chalmers Mfg. Co.

MOTORS AND CONTROL

35 Bulletin GEA-4131 illustrates and describes motors and control for hazardous locations. General Electric Co.

FIBERGLAS

36 Booklet entitled "Facts About Fiberglas For Design Engineers." Product, forms and size, major properties, principal uses and many illustrations are given. Owens-Corning Fiberglas Corporation.

GENERATORS

37 A 12-page folder describing and illustrating the Katolight generators for generating a-c electric power. Kato Engineering Co.

LIQUID POLYSTYRENE

38 A new technical bulletin giving information on "Polyweld" (liquid polystyrene). American Phenolic Corporation.

INSTRUMENTS

39 Bulletin No. 113 features volt-ohm-milliammeter, speed-o-meter, meg-o-meter, a-c ammmeter and voltage tester. Superior Instruments Co.

SYNTHETIC RUBBER SHEET STOCKS

40 A 10-page technical service manual describing "Fairprene" synthetic rubber sheet stocks. E. I. du Pont de Nemours & Company.

IGNITRON TUBE

41 A 24-page publication (ETI-21) describes the operating characteristics and performance ratings of the ignitron tube types with an explanation of how they are used in welding circuits and for power rectification. General Electric Company.

SCHOOL FLUORESCENT DATA

42 Four new data sheets illustrating fluorescent lighting layouts for school classrooms. Glare, painting, wiring, maintenance, etc., are discussed. Suggestions for air disinfection in classrooms are diagrammed. The Edwin F. Guth Company.

RESISTORS

43 A new 32-page resistor catalog describes and illustrates various types of units, gives sizes, resistance values, mounting and enclosures. Ward Leonard Electric Company.

SOLENOID VALVES

44 Circular No. 200 features valves for the automatic and remote control of the flow of liquids and gases. Automatic Switch Co.

TWIST DRILLS

45 A table of Decimal Equivalents of twist drills, printed in pocket size card form, shows diameter for each size. Manufacturers Screw Products.

ELECTRIC PRODUCTS

46 Catalog 451 features safety switches, range panels, Kbl-duct, lighting panels, SAFtoFUse panels, Vacu-break switchboards, circuit master and Bustribution duct. BullDog Electric Products Co.

47 An 8-page publication (ETR-7) featuring the disk-seal elec-

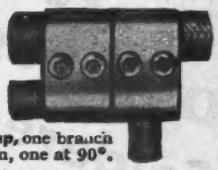


It's Easy to pick the right CABLE TAP— **from the *Complete* line**

You'll find the widest variety of parallel and 90° taps, combinations, and gutter taps—in a range of sizes up to 1,000,000 cm. Insulating Bakelite covers can be furnished for all types.



Single 90° Tap from main conductor.



Combination Tap, one branch parallel to main, one at 90°.



2-Way Gutter Tap.



Bakelite Covers can be furnished for all types of Penn-Union cable taps.



3-Way; continuous main and two separate branches.

Also a complete line of Service Connectors, Terminals, Tees, Straight and Parallel Connectors, Grounding Connectors, etc. — every good type of conductor fitting. And every one is accurately made, thoroughly tested — *dependable.*

PENN-UNION
ELECTRIC CORPORATION
ERIE, PA.

PENN-UNION
Conductor Fittings



For Dependable Soldered Connections

You get a perfect solder joint every time when you use Sherman Lugs, because we take a lot of pains to see that Sherman Lugs are clean, bright, and free from grease — inside as well as outside.

To prepare them for good soldering, Sherman Lugs, after they are made, are first tumbled in sawdust. Then they go through a special acid cleaning bath (bright finish) which removes all traces of corrosion, dirt, grease or other foreign matter. After that, they are rigidly inspected to make sure that every individual lug is perfect.

Sherman also has complete facilities for hot tinning and electro-tinning.

Specify Sherman Lugs on your next order. You'll find that it pays!

Also:

Solderless Lugs

Wedge Grip Connectors

Ground Clamps and Fittings

Fixture Connectors

H. B. Sherman Mfg. Company
Battle Creek, Michigan

Write for Sherman Catalog!

tronic tube, known as "lighthouse tube." It describes the basic principles of design and operation of the tube, which will be applied to television, FM radio and other fields in the ultra-high frequency spectrum. General Electric Company.

VECTOR CHART

48 A chart for determining the capacitor KVAR required to increase power factor to any desired value. On the reverse side of chart are tables on the effect of improving power factor on a three-phase circuit in conduit, also capacitor application formulae. Cornell-Dubilier Electric Corp.

ELECTROSTATIC PROCESSES

49 An 8-page pamphlet telling the story of electrostatic painting processes and its use on articles handled on a conveyorized basis. Illustrations and diagrams are shown. Harper J. Ransburg Co.

ELECTRONIC EQUIPMENT

50 A 36-page catalog on radio and electronic equipment, featuring advanced types of electronic instruments, devices and tools. Walker-Jimieson, Inc.

LIGHTING EQUIPMENT

51 A six-page booklet illustrating and describing the new and improved URC fluorescent unit called Solarite. Solar Light Manufacturing Co.

INSTRUMENTS

52 Bulletin GEA-4324 illustrates and describes tachometers to measure rotational speeds from 1 to 60,000 rpm. and linear speeds which can be measured in terms of rpm. General Electric Co.

COMMUTATORS AND SLIP RINGS

53 A new data book on commutators and slip rings. It includes from 15 basic types to over 3000 variations of commutators and slip rings. The Toledo Standard Commutator Co.

SELENIUM RECTIFIERS

54 Bulletin RDP-107 is an engineering manual and includes standard element specifications. Fansteel Metallurgical Corp.

DISTRIBUTION

55 A new 28-page booklet entitled "Tomorrow's Electrical Distribution-Via Graybar." It gives many illustrations and charts. Graybar Electric Company, Inc.

SOLDERING TOOLS

56 A folder illustrating and describing "Thermo-Grip" electric soldering tools, for higher melting point solders. Ideal Commutator Dresser Co.

TELEPHONE SYSTEMS

57 A folder presenting the PAX telephone systems. It covers its operation and variety of organizational uses. Kellogg Switchboard & Supply Company.

WELDING ELECTRODES

58 A comparison chart, Bulletin B6344A, of welding electrodes comparing equipment from 22 manufactures, contains information on stainless steel and hard surfacing electrodes, as well as mild steel type. Allis-Chalmers Mfg. Co.

STOP WATCHES

59 Bulletin No. 575 illustrates and describes stop watches of the 1/5 second and also the decimal timers which divides the minute into 100 parts. Herman H. Sticht Company, Inc.

INDICATING INSTRUMENTS

60 A 12-page booklet explaining the history, uses and advantages of Marion-Glass-to-Metal hermetically sealed electrical indicating instruments. Marion Electrical Instument Company.

ZIM CUTTER

61 A folder illustrating and describing the Zim cutter. No. 2, a general utility cutting tool. William-Leonard & Associates.

ELECTRICAL TAPE

62 A 24-page catalog featuring electrical insulating tapes. It contains a chart of the relative properties of 18 different types of electrical tapes and many illustrations. Minnesota Mining and Manufacturing Company, St. Paul 6, Minn.

LIGHTING FIXTURES

63 A folder featuring fluorescent and incandescent lighting for drafting rooms. Holophane Company, Inc.

PRECISION SWITCHES

64 A catalog and handbook illustrating and describing light pressure precision switches. Mu-Switch Corporation.

LIGHT BULBS

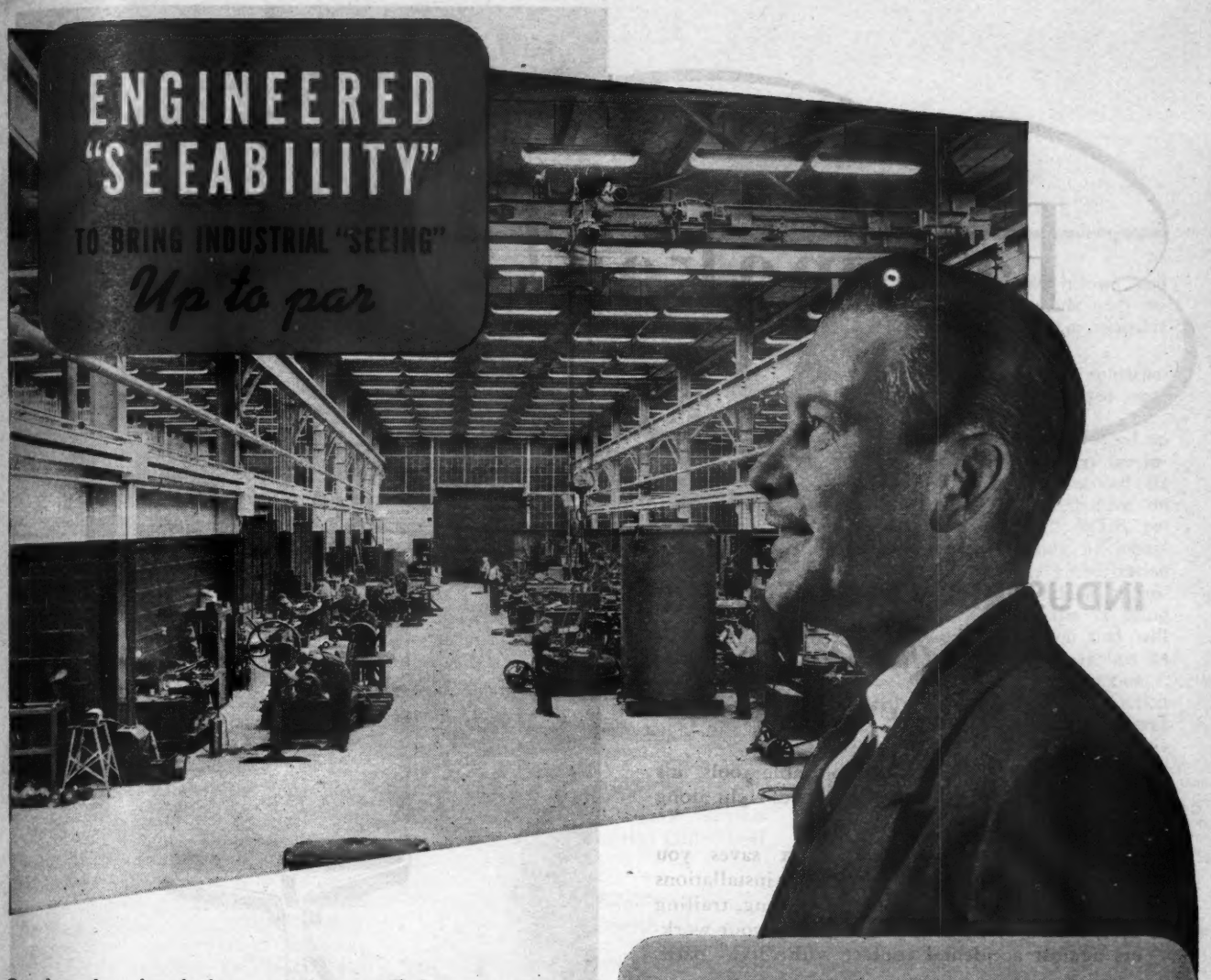
65 Booklet No. 2096W describes a promotional program designed to "make the light bulb department the brighest spot in the store". Westinghouse Electric Corp.

WIRE STRIPPERS

66 A folder illustrating and describing wire strippers for many types of jobs. Ideal Commutator Dresser Co.

FLUORESCENT LIGHTING FIXTURES

67 Two bulletins describnig and illustrating fluorescent lighting fixtures for commercial and industrial uses. Centralite Company, division of Central Neon Company.



Good seeing is vital to employee efficiency . . . it reduces fatigue . . . builds high morale, and ups production. And if your lighting system is no longer modern . . . if light is poorly distributed . . . with direct glare . . . full of dark spots . . . or of low intensity —you need the benefits of lighting modernization. You need it to compete with the scores of newly-built, highly efficient war plants.

To gain these benefits, call your Westinghouse Distributor. He is your source for the most efficient lighting today—lighting which utilizes the latest knowledge of intensities, diffusions, distributions, colors, mounting heights and other important factors.

In addition to this knowledge and experience, your Westinghouse Distributor has available a broad line of luminaires to fit every "seeing" requirement.

Don't hamper your operations by poor seeing. Ask your Westinghouse Distributor to survey your lighting . . . and watch how modern lighting helps you. J-04061

Westinghouse

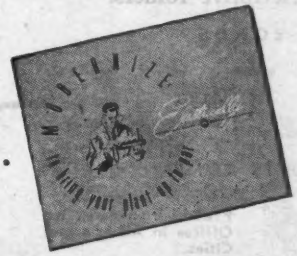
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

. . . ANOTHER OF THE 22 WAYS YOUR

WESTINGHOUSE DISTRIBUTOR

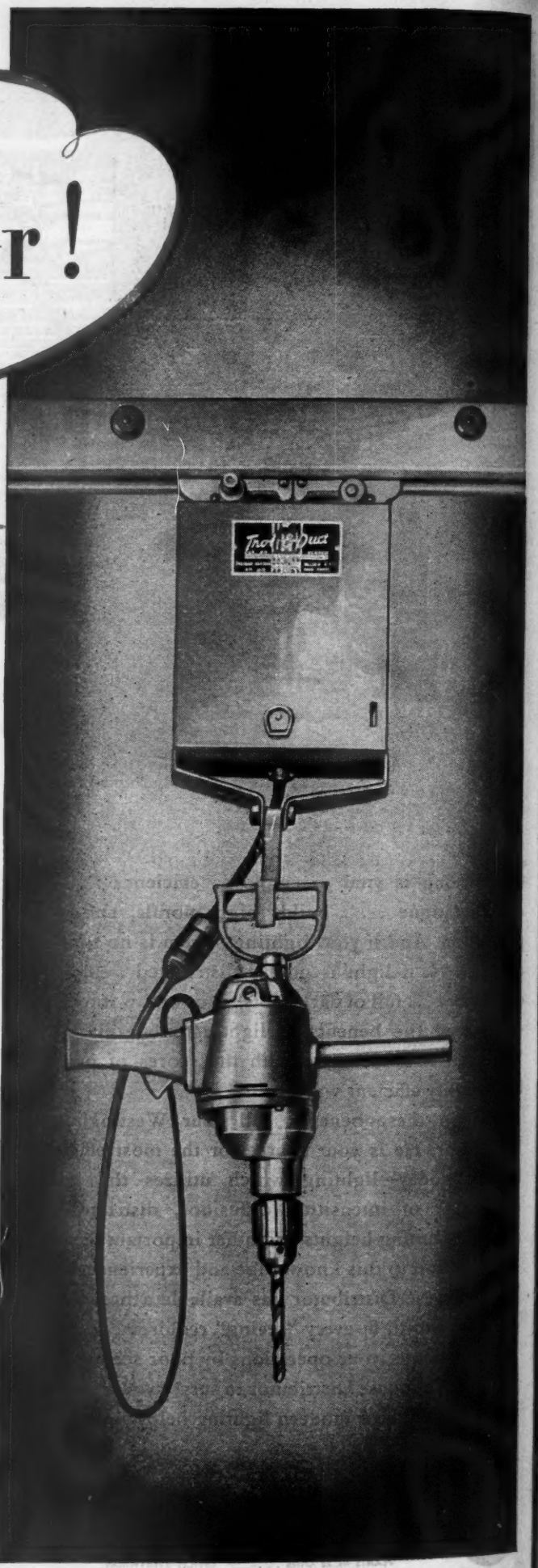
CAN HELP YOU MODERNIZE

Electrically



TWENTY-ONE OTHER WAYS your Westinghouse Distributor can help you in planning electrical modernization, whether for a single department or for your entire plant, are suggested in this new book. It provides a valuable check list on modern electrical practices . . . from incoming electrical power to methods of utilization and control. Ask your Westinghouse Distributor today for a copy of B-3476. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Pacemaker!



BULLDOG
INDUSTRIAL TROL-E-DUCT
Moves the Power with the Load

When power is needed for portable tools, it's there — right overhead. And it moves right along with the job.

BullDog Industrial Trol-E-Duct saves you money — does away with expensive installations of fixed wiring and the dangers of long, trailing cables. Completely enclosed, it guards your workers against accidental contact with "live" parts.

This safety feature also makes it an ideal electric feeder for Cranes and Hoists.

Industrial Trol-E-Duct gives you a flexible system — sections can be added any time you want to expand or change your shop set-up. And the whole system can easily be moved anywhere in your plant. It is 100% salvable, too — nothing to scrap.

Single Phase or Three Phase, AC or DC — 575 Volts or Less.

For nearly half a century, we have been "pacemakers" in electrical distribution systems. We invite you to consult expert BullDog field engineers about the power problems in your plant. Or write us for descriptive folders.

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ELECTRIC PRODUCTS COMPANY

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Field Engineering Offices in All Principal Cities.

Also Manufacturers of Vacu-Break Safety Switches — SafToFuse Panelboards—Switchboards—Circuit Master Breakers—BUStr'bution Duct, for "plug-in" power—Universal Trol-E-Duct, for flexible lighting.

IN THE NEWS

WPB RECONVERSION POLICIES

Swift shift to civilian production requires cancellation of most wartime controls. Only controls to be retained will be those considered necessary for orderly transition.

Our total mobilization for war has resulted in total victory over our enemies. We now face the challenge of converting from war to peace. This transition will not be easy. It will require the same energies, skills and cooperation that won the war.

As this is written, Government Agencies are busily engaged studying which wartime curbs are still to be dropped, and when; and which controls should be retained, and how long. Revocations of WPB controls are being made daily. Rationing of many commodities has been ended. Some war agencies have been abolished, and others are fast completing their work. In some instances, work of one war agency is being consolidated with that of some other government agency.

WPB assigned to a special "Committee on Period One", established several months ago, the preparation of its reconversion policy, covering the reconversion of industry to civilian production.

In effect this policy, now in the stage of a plan being put into action, calls for revocation of all possible controls. Only those controls which will be necessary to prevent industrial dislocation and bottlenecks which might prove harmful to reemployment, and those necessary to assure stabilization, will be retained, WPB has stated. J. A. Krug, WPB Chairman, has stressed the fact that even the controls which are being retained are only a temporary measure, and will be revoked as soon as possible.

WPB'S RECONVERSION PLAN: The high points of WPB's plan for reconversion of industry to civilian production made public by Chairman J. A. Krug, following President Truman's announcement of Japan's unconditional surrender, are as follows:

1. All but a handful of orders will be cancelled within a few weeks.
2. Release of a huge industrial building program through a plan to relax industrial construction controls, designed to absorb manpower and materials freed by military cutbacks.
3. Remove ceilings on production of automobiles and other consumer durable goods for all-out production programs.
4. Orders controlling materials that are still in short supply, tin, crude rubber, textiles, lumber, etc., will be retained until shortages ease or until there is no longer any danger of a scramble.
5. Inventory controls will be retained until danger of hoarding, pre-emptive buying and stockpiling by the few at the expense of the many is over.
6. Preferential protection of small business ($50,000 or less per quarter) will be retained until the effects of cutbacks can be appraised.
7. Powers for breaking bottlenecks or giving protection to military or highly essential civilian or export needs will be retained, but used only where necessary.
8. Board will take vigorous action to expand production of materials which are in short supply to meet civilian demands and will work with OPA, WMC and other agencies whose operations are important to the rapid expansion of such production.

The War Manpower Commission estimated that unemployment might exceed 5,000,000 within three months after V-J Day. WPB is paving the way for increased building construction, in order to afford some measure of shock for this unemployment. Construction Order L-41 was amended August 13 (see below), and further studies are being made with respect to further relaxation or possible revocation, of this control.

Controls affecting electrical construction and maintenance are discussed separately below.

CONSTRUCTION: Acting to speed up reconversion and to clear the way for industrial expansion, WPB amended its construction order (L-41) effective on August 13. "This action," WPB reported, "is aimed at speeding up industrial construction through authorization of projects to provide additional manufacturing facilities." Emphasis is being placed on industrial expansion that will give employment to workers as fast as they are released from war production.

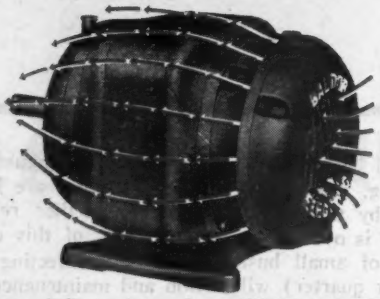
The total volume of new construction for the year ending June 30, 1945, was $4,000,000,000, of which $385,000,000 was for new industrial plants built with private funds.

"Had construction materials been freely available," WPB said, "this volume



"It's Mr. Brown's idea, Boss. He has a hard time finding the light switch when he comes home late."

THE MOTOR for MANY APPLICATIONS



Arrows indicate air travel over ENTIRE EXTERIOR of BALDOR STREAMCOOLED Motor

BALDOR STREAMCOOLED MOTOR

This ALL-PURPOSE MOTOR will simplify your Designing, Purchasing, Production and Inventory. Check these features with your motor specifications:

1 Totally enclosed — ball bearing.
2 Drip-proof; splash-proof; grit-proof; lint-proof.
3 Horizontal, vertical and side wall mounting.
4 Removable base.
5 End plates interchangeable for face mounting.
6 Standard NEMA dimensions.
7 Standard or glass insulation.

BALDOR ELECTRIC COMPANY, St. Louis 10, Mo.

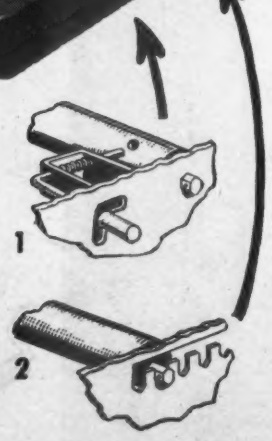
District Offices in Principal Cities

ROLL-A-REEL

Speeds up reel handling



. . . and makes it easy too



Here's a simple—light-weight—easy way to handle heavy reels. ROLL-A-REEL is light enough to be carried to the job—easily moved about the store-room—sturdily built to stand rough use. Furnished in single reel capacity—28" wide—$37.50, two reel capacity—48" wide —$75.00.

1. Positive front roller lock insures easy loading and unloading of reel without jacks.
2. Ball bearing rollers have hex ends which lock in channel slots. Thus reel rolls on ball bearing rollers smoothly—no friction.

ROLL-A-REEL 327 WEST FOURTH STREET CINCINNATI 2, OHIO

of private industrial construction would have been around $8,000,000,000 to $12,000,000,000—two to three times as much as actually built—in the same year."

The new amendment recognizes the urgency of completing industrial and other types of construction authorized without general priorities assistance, and permits application for assistance on bottleneck items for projects initially approved without priorities.

PRIORITIES: Virtually all allotments of controlled materials and all preference ratings assigned by the Army, Navy, or United States Maritime Commission *except the new MM "military" ratings and AAA ratings*, have been cancelled.

This large-scale cancellation of all allotments and ratings, identified with CMP allotment symbols whose initial letters are W, O. M (except M-8), N and C, made possible because of tremendous military cutbacks, was made in order to get orders unrated as fast as possible, WPB explained. This action was taken through Direction I to Priorities Regulation 29.

This means that any rated order other than AAA or MM identified with CMP allotments carrying the above letter symbols must be treated as unrated orders. Where ratings are necessary, manufacturers can obtain MM preference ratings from the appropriate agency only under the conditions provided by Priorities Regulation 29.

The above action, it should be noted, applies only to military ratings and allotments. It does not mean the revocation of the entire Controlled Materials Plan, which governs the three major metals. However, revocation of CMP as a whole is scheduled to be effective September 30, WPB has announced.

ELECTRICAL MACHINERY AND PRODUCTS: WPB controls over the majority of the industries have been reduced to overall WPB orders and regulations. This occurred with the revocation of the many "L-orders" following V-E Day.

The large-scale termination of war contracts which have already been made, has released tremendous quantities of materials. It has also released millions of workers who must now turn to peacetime industry for work.

FEAR POSTWAR SHORTAGE OF JOURNEYMEN ELECTRICIANS

The electrician's trade will be short about 35,000 journeymen when conversion to peace comes, E. J. Brown, international president, International Brotherhood of Electrical Workers, told the 12-man joint labor-management committee on postwar problems of the electrical construction industry at their recent two-day session at the Hotel Schroeder, Milwaukee, Wisconsin. Even if the 30,000 IBEW members now in the armed forces all return in time to resume work in the first year of reconversion, there still will be a shortage of 25,000 due to loss from natural causes, he revealed, stressing the need for stronger apprenticeship programs.

According to Marion H. Hedges, research director, IBEW and Paul M. Geary, assistant general manager, National Electrical Contractors Association, the electrician's trade as well as other building trades is being filled with old men and, unless more apprentices are recruited, the trade will die out. Hedges and Geary are co-chairmen of this joint labor-management committee studying the problem.

The average age of electricians has increased from 32 to 44 and the age for retirement on pension is 65, Mr. Hedges related. With the trade losing 20,000 men per year by death, old age and sickness, that decline will equal the present 400,000 IBEW membership in 20 years, he added. Unless more apprentices are brought in, there won't be enough new money coming in to pay the pensions of those who live the longest, Mr. Geary contended. To attack this problem labor-management committees are being set up throughout the nation under the chairmanship of E. H. Herzberg, manager of the Milwaukee Electrical Contractors Association. Some 200 of those committees are now organized.

The electricians' trade is one of the few trades where technological advances have increased the value of the mechanic, said Mr. Hedges, viewing it as a swiftly expanding field where there will be constant new job opportunities if we are alive to opportunity. The committee agreed that the electrical contracting business is on the upswing with electrical work now comprising 10 percent of all building construction (former figure was 5 percent). This, it was explained, was due to the greater application of individual motor drives, expansion of air conditioning, new electronic devices and other advances.

The IBEW is trying to meet the problem through its national electronics school now being conducted at Marquette University. Reports indicate that plans are now being formed to conduct a similar school for television as soon as sufficient equipment is available. Cooperation with management in training apprentices on the job and in trade schools, paying them while they learn, was announced as an IBEW aim.

To make employment in the electrical contracting business more attractive and bring it on a competitive level with other vocations, it was revealed that a scheme is being devised for management contribution toward medical, surgical and hospital care, disability insurance, increased pensions, and vacations with pay.

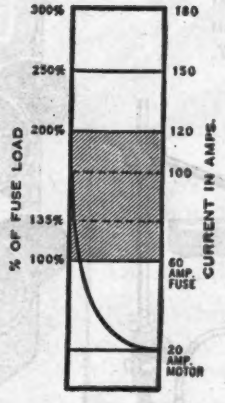
War veterans who return to their old jobs as union electricians will be assisted into those jobs in every way possible. In case a disabled electrical worker cannot perform his old duties, he will be fitted into a job that he can handle in an associated occupation, according to statements of Mr. Brown and Mr. Geary. Fullest consideration will be given to the trade skill acquired by the war veteran in the armed forces. Elaborating, Mr. Brown revealed that Navy trained men, for the most part, are developed into excellent craftsmen, but the same cannot be said of Army veterans. Past experience indi-



THERE'S SOMETHING NEW UNDER THE SUN

BALANCED LAG

by PIERCE



Curve shows relationship between starting current of normal squirrel-cage motor and load on fuse. Note how "peak" falls within shaded area.

Pierce engineers' new link is the first link purposely designed to obtain lag-balance between "overload" and trouble zones, by placing more of the lag down in the working "overload range" of the link.

"Overload range" falls between 100% and 200% of fuse rating, where the new Pierce B/L links hold 135% fuse-loads 3 to 5 times longer than any other well-known lag-links tested, with similar balance throughout the "overload" range.

SOLD THROUGH LEADING DISTRIBUTORS

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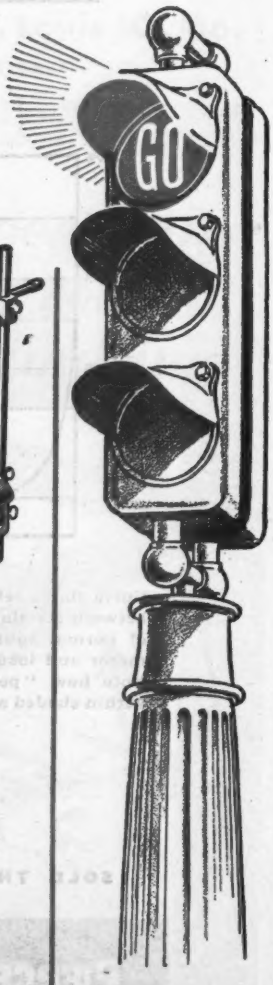
Pioneers in
LIGHTING EQUIPMENT
Since 1880

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The Green Light says GO!

WE'RE READY . . . with over 60 of the fastest selling pre-war lamps and fixtures

Until now, our facilities have been 100% engaged in vital war production. NOW, with restrictions partially lifted, we're starting production on these "best sellers" in accordance with a carefully worked out "quick reconversion" plan. They're FARIES QUALITY, and competitively priced.



DESK LAMPS, FLOOR LAMPS and Industrial Brackets

The items shown, as well as many others displayed in the Flyer Catalog, will be available just as soon as raw materials are obtainable . . . some numbers before others. No preference rating of any kind is necessary, altho, under the regulations, rated orders must be shipped first. Get your orders in now to be assured of early delivery from our first production run.



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. . . just off the press . . . illustrating the 60-odd "best selling" numbers that are available NOW.

New Flyer Catalog

FARIES MFG. CO. DECATUR ILLINOIS

cates that they are not being trained well enough, from a vocational angle, and misunderstandings arise when such veterans apply for work and employers discover that they need additional training.

To help alleviate the manpower shortage, Mr. Brown said the IBEW is waiving the initiation fee for war veterans who demonstrate their mechanical aptitude. The IBEW and management together will determine the number of apprentices that should be taken annually, based on the yearly business outlook.

KENTUCKY INSPECTORS STUDY WIRING TECHNIQUES

More is needed than just a mere word for word knowledge of the National Electrical Code to offer an intelligent appraisal and inspection of wiring systems from the standpoint of safety. Familiarity with equipment, materials and devices and the "why and how" of their development and construction is an important adjunct to code knowledge. With this in mind the program committee of the Kentucky Chapter, IAEI, provided its members with a two-day technical session at the Chapter's semi-annual meeting held at the Helm Hotel, Bowling Green, Ky., June 21-22.

The initial talk of the first session—a report of the Committee on New Materials, Wiring Methods and Devices, presented by its chairman, Walter D. Roach—paved the way for the presentation of succeeding discussions of new ideas, materials and techniques. Among the report's suggestions and recommendations were: More extensive rural use of non-metallic, non-corrosive wiring systems for stables, barns and small out-buildings; more extensive application of non-metallic sheathed cable assemblies with non-metallic outlet and switch boxes. The committee again recommended the adoption and general use of the Bare Neutral System of Wiring for lighting installations. A resolution to this effect was passed at the annual meeting of the group in January at Louisville (E.C., March, 1945, pg. 167). In concluding, Mr. Roach reiterated the hope that the suggestions of his committee report would receive consideration by the Electrical Committee and other interested parties.

Bare Neutral Wiring Systems was again discussed later in the day when J. C. Runyon, consulting engineer, Falls Church, Va., outlined the several advantages of this wiring method. Mr. Runyon, an avid proponent of the system—purely from an engineering and safety interest, made an extensive study of the system in 1934 and has been closely following it since that time. Reviewing the origin and development of the "neutral" in wiring systems, he stated that its true safety lay in its positive continuity as a return source and that bare neutral is the final step assuring this continuity.

Refuting the contentions of past opposition, Mr. Runyon continued by outlining the advantages of bar neutral sy-

tems. Quoting from an authoritative report made by a recognized engineer to the U. S. Army in March 1942, he listed these advantages as:

1. Positive identification of grounded conductor.

2. Eliminates possibility of reversal which can create numerous hazards.

3. Makes grounding of raceways, fittings and boxes more positive.

4. Provides greater radiating and carrying capacity in the neutral through contact with the metal envelope—needed particularly at time of fault.

5. Bare neutral overcomes objection of armored cable by automatically providing a bonding conductor, thereby reducing resistance of the sheath and practically eliminating the possibility of a dangerously heated sheath from fault current.

Discussing the stray current question, Mr. Runyon stated that it is self-evident that the metal of a system becomes energized with a fault. With an insulated neutral, all fault current must stray back through any available path—pipes and building frame. With a bare neutral of a definite low resistance, the large return current—otherwise stray—is mostly confined to its neutral conductor, at the same time opening the overload device and cutting off the current. The next logical step, he added, is polarized plug receptacles and manufacturers are already tooled for this. Once bare neutral assumes its rightful place as a safety wiring method, Mr. Runyon predicted such a public demand for conversion from the insulated neutral as to create a billion-dollar business.

J. A. Trovillo, assistant secretary, Underwriters' Laboratories, Inc., Chicago, gave the inspectors a behind-the-scenes picture of the paces appliances, regardless of size or complexity, must go through before they are approved. Using the "Standard for Attachment Plugs and Receptacles" as an example, he followed the step by step test procedure for this simple device. Concluding, he stated that the follow-up program of the Laboratories depended in part upon help from inspectors and manufacturers who question poor performance or doubtful construction. He demonstrated a corrected snap-switch that resulted from questions raised at the last Kentucky Chapter meeting.

One of the most important points which an electrical contractor raises when he is being sold lighting fixtures is the ease of installation, stated Robert Bacon, field engineer, Sylvania Electric Products Co., Cleveland, Ohio, while discussing the construction and application of lighting fixtures. Mr. Bacon defined a modern fixture as one that will fully meet customer and factory requirements. Continuing, he described in detail various Sylvania fixture mountings designed to facilitate installation of industrial, commercial and residential units. Concluding, he announced the development of a new line of Long Slim Lamps (fluorescent) with two-contact lampholders combining a cut-out in the lamp circuit (necessitated by high starting and operating voltages).

Wiring is the nerve center of the home,

In Severe Locations

Install G-E WHITE RIGID CONDUIT



G-E White Rigid Conduit will give permanent protection to wiring in the severest locations. It is resistant to heat, flame, cold, moisture, gas, alkalies and mechanical injury.

G-E White is heavily coated with zinc inside and outside by immersion in molten zinc—the hot-dipped galvanizing method. This method provides the most durable coating of pure zinc that can be applied by any process. In addition, G-E White has a coating of baked Glyptal inside and out.

G-E White is easy to install. It is uniform. It has accurate threads. Its smooth interior surface aids wire pulling. (Another G-E conduit, G-E Black, is also available. This conduit is enamel-coated and is recommended for interior use where conduit is exposed to chemical corrosion.)

For further information see the nearest G-E Merchandise Distributor or write to Section C-951-8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

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GENERAL ELECTRIC

BUILT FOR Hard SERVICE



Here Are Commutators that Can "Take It"—

Built with Precision from the finest grade of hard drawn silver-bearing copper and mica insulation.
Built for Longer Life—our staff of engineers has had years of "know how" experience in building better commutators—their services are yours for the asking.

THREE FACTORIES TO SERVE YOU

TOLEDO STANDARD COMMUTATOR CO. – Toledo 6, Ohio
HOMER COMMUTATOR CORP. – Cleveland 3, Ohio
HILLSDALE COMMUTATOR CO. – Hillsdale, Michigan

THE NATION'S LARGEST EXCLUSIVE MANUFACTURERS OF QUALITY COMMUTATORS

THE IWI MAN WITH A WISE PLAN *carries*

ESSEX MAGNET WIRE



Saves hours and steps... buy from the IWI Blue Catalog

Specialization in magnet wire problems has enabled ESSEX to develop economical, easy-to-handle and varied wire types for your different needs. They're listed in the IWI Blue Catalog.

INSULATION AND WIRES IWI SERVICE

INSULATION & WIRES, INC.
2127 PINE STREET • ST. LOUIS, MO.

so be sure it is adequate for today's needs and tomorrow's desires, cautioned R. W. Wilson, manager, commercial service, Kentucky Utilities Company, as he developed the subject of "Living in 194X". Adequate Wiring is not a brand or trade name. It simply means a large enough service switch and sufficient circuits of proper wire size to permit convenient and efficient use of electrical appliances and equipment, he continued as he listed the scores of electrical gadgets that we may have in the postwar residence.

R. L. Findley, electrical engineer, Westinghouse Electric & Manufacturing Co., engineering and service department, Cincinnati, gave the inspectors a clearer conception of power factor correction and its application to industrial power systems. To explain the theory, he used the well known glass of beer analogy depicting the suds as the reactive kva. or "wasted watts". Representing the capacitor as another container with a light suction drawing off the foam in the glass, he compared the de-foamed area of the glass with the additional conductor capacity the application of capacitors provided in power systems. A discussion of application factors concluded Mr. Findley's presentation.

An exceptionally interesting discussion of electric motor characteristics and protection techniques was given by J. M. Chandlee, manager, service department, Century Electric Co., St. Louis, Mo. Touching the high spots of motor characteristics and their relation to failure and protection he concluded by predicting the development of a built-in motor protective device on refrigerating units, the operation of which will be a function of the heat generated in the motor. Such a device is now in the experimental stage.

The story of armored cable—its history and development—was told by H. M. Dreher, electrical engineer, Armored Conductor and Flexible Metallic Conduit Section, NEMA, New York. Emphasizing the metallic ground protection and tamper-proof features of the cable, he concluded by soliciting the help of inspectors in offering, from their experience, suggestions for improving the product.

The requirements for installing electrical equipment in hazardous locations—another topic of vital importance to inspector groups—was discussed by F. J. McJames, public relations representative, Crouse-Hinds Company, Syracuse, N. Y. Frank B. Lee, district engineer, lamp department, General Electric Co., St. Louis, followed with a revealing story on new fluorescent light sources. An insight into what to expect in the new National Electrical Code, by Victor H. Tousley, field engineer, NFPA concluded the technical sessions of the conference.

Inspectors have unusual problems and experiences in their field work. In the Kentucky Chapter, a contest is held at each conference to draw out such experiences. At this session, those of E. H. Rueppel, W. H. Waller and Howard Jaberg were unique enough to win the prizes offered.

This conference also marked the Tenth Anniversary of the Little Brown Jug Luncheon Club, organized by the Kentucky Chapter on June 21, 1935 for the purpose of "Fostering harmonious relationships, promoting good fellowship, and developing interest in the affairs of the electrical industry through such relationship", according to the certificate of membership. Presiding over the luncheon was "Head Jugger" E. M. "Butch" Nelson, (appointed in January 1940), of I. A. Bennett & Co., Chicago, and "Acting Head Jugger" R. J. Heffernan.

IAEI PLANS CURTAILED SECTIONAL MEETINGS

In conformity with Federal regulations affecting travel, the Executive Council IAEI has sanctioned Sectional meetings to permit transaction only of essential Section business—election of officers; reports of officers, committees and a possible study of Article Committee Reports for the amendments to the 1940 National Electrical Code.

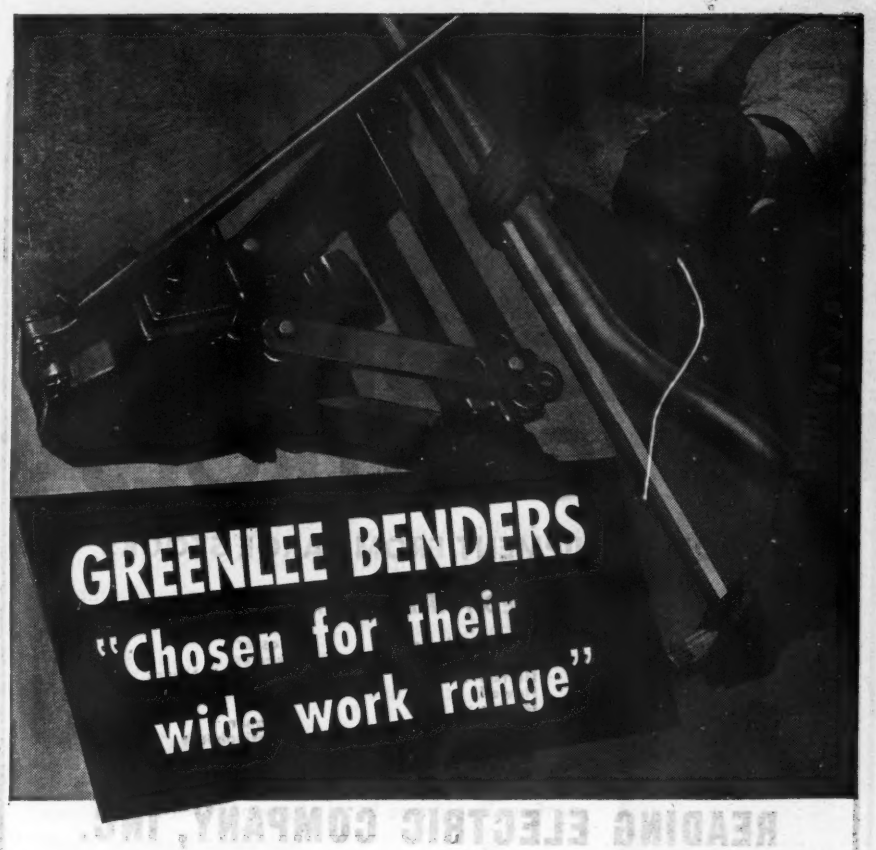
The Sectional meetings are to be scheduled for the following dates previously approved by the Executive Council:

Northwestern Section—Sept. 24-26 incl.
Southwestern Section—Oct. 1-3 incl.
Western Section—Oct. 15-17 incl.
Eastern Section—Oct. 22-24 incl.
Southern Section—Oct. 29-31 incl.

The assumed attendance at the conferences will include the IAEI president and secretary; officers of the section, including members of the Section Executive Committee; any member or alternate on the Electrical Committee; the chairmen of important Section committees. It is recommended that the remainder of the 50 out-of-town delegates be apportioned evenly among the Chapters or States where no Chapters exist. Such groups should include Chapter officers and executive committee—other Chapter delegates to be determined by the Chapter officers.



Contractor-dealers attending recent meeting of the Electric Association in Chicago to hear Wm. A. Ritt, Minneapolis discuss the cost of doing business were (L to R) A. R. Holt and George Elmund, Elmhurst, Illinois; and Joseph Turek of Berwyn, Illinois.



"Our installation work not only keeps our benders in constant, heavy use, but they must be able to make a wide variety of bends on a good spread of pipe sizes," says Mr. A. E. Curran of Edward J. White Company, Newark, N. J. "That's why we chose GREENLEE Hydraulic Benders . . . for stamina and versatility."

You, too, will find that whatever the bending job, there's a GREENLEE to do it. With a GREENLEE *one man* makes smooth, accurate bends in a few minutes—in pipe up to 4½", rigid and *thin-wall* conduit, tubing, bus-bars.

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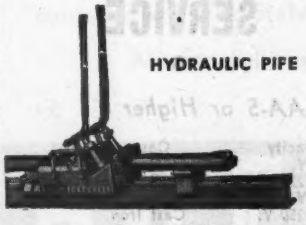
For complete facts on these and other time-saving GREENLEE tools, write today for your free copy of Catalog 33E. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1749 Columbia Avenue, Rockford, Illinois.



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Some members of the IAEI Executive Council suggested that no provisions be made for entertainment and supplementary activities at these meetings. All business matters determined by vote at these sessions will be finally subjected to approval by mail ballot to the Section members.

This temporary arrangement is due to the conditions of the present time and should receive wholehearted cooperation of the members. It is subject to any relaxation by the War Convention Committee that may occur between now and the time of the meetings.

INDUSTRY COMMITTEE APPROVES WIRING STANDARDS

The Industry Committee on Interior Wiring Design met in New York on June 26. The review of the Residential Wiring Standard and the Farmstead Wiring Standard, as submitted by the Technical Subcommittee, was the prime order of business.

Both standards were approved by the committee with minor changes. These standards are now going to the sponsoring associations for formal approval prior to printing. It is expected that the books will be available in printed form late this Fall.

The contents of the Residential Wiring Handbook covers among other items—requirements for outlets, branch circuits, feeder circuits, service entrance, signal and communications, radio and television, and telephones.

The Farmstead Handbook is divided into two parts; the first part dealing with the interior wiring design of farmstead buildings, and the second part with exterior distribution on the farm. Part I consists of several sections, each section covering structures for a given enterprise—dairy structures, poultry structures, beef cattle structures, horse structures, hog structures, sheep structures, field crops, fruit and vegetable crops are among the items covered. In addition, sections will be found on farm shop and machinery sheds, water supply, farm residence, etc. Part II covers the various types of metering on a farm, i.e. pole, outdoor, and indoor; exterior lighting is included and many tables on demands, voltage drops, etc., are given.

Action on standards for "Multiple Family Dwellings and General Occupancies" will be delayed until the Residential and Farmstead Handbooks are ready for distribution. The Technical Subcommittee was requested to proceed with a study of a "Wiring Standard" for application to low-cost housing.

The Technical Subcommittee which has been at work on the Residential and Farmstead Wiring Handbooks for about one year is composed of nine members. A. Carl Bredahl is chairman, with Morris Lloyd and H. R. Stevenson as chairmen of the sectional subcommittees on Farmstead and Residential Wiring respectively. Arthur Abbott, Leo Dolkart,

H. G. Knoderer, George McKee, C. P. Wagnor, and C. A. Ward complete the committee.

The Industry Committee on Interior Wiring Design is under the chairmanship of E. A. Brand of the Buffalo, Niagara, & Eastern Power Corporation; A. Carl Bredahl of the Westinghouse Electric Corporation is secretary. The committee is sponsored by ten groups; namely, the American Institute of Electrical Engineers, American Lighting Equipment Association, American Society of Agricultural Engineers, Edison Electric Institute, International Association of Electrical Inspectors, Illuminating Engineering Society, National Electrical Contractors Association, National Electrical Manufacturers Association, National Electrical Wholesalers Association, and Radio Manufacturers Association.

K. M. RYALS PRESIDENT PACIFIC COAST ASSOCIATION

Kenneth M. Ryals, partner in Stone-Ryals Electric & Manufacturing Co., San Francisco, who recently assumed the office of president of the Pacific Coast Electrical Association, is the first electrical contractor to be elected to the post.

In 1920, with Floyd Stone, Mr. Ryals formed the Stone-Ryals Electric & Manufacturing Co. to carry on electrical contracting, motor repairing and rewinding, and manufacturing of resistance and spot welders and bandsaw welders under the trade name of Stryco. At present engaged in extensive repair work on battle damaged Navy electrical equipment, the firm in peace time specialized in automatic production machinery for food processors.

Mr. Ryals has served as president of several other electrical organizations, including the San Francisco Electrical Contractor Association 1937–38; the Northern California Electrical Contractors Association 1939–40; and the Elec-



KENNETH M. RYALS

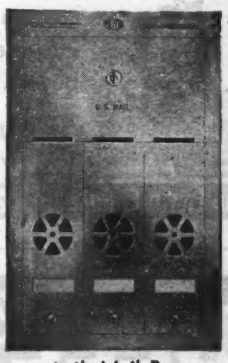
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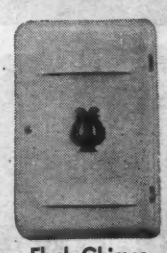
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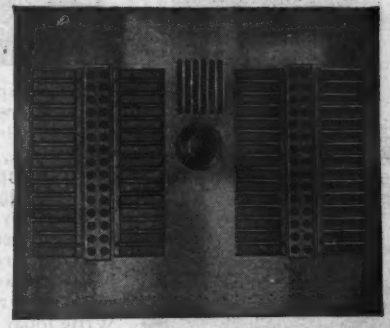
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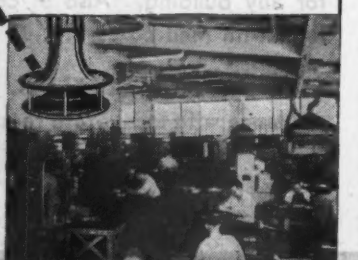
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tric Club of San Francisco 1940-41. He has been a director of the P.C.E.A. for six years and is at present a member of the board of the San Francisco Electrical Contractors Association.

DENDEL ELECTED IAEI PRESIDENT

L. P. Dendel, assistant secretary of the Michigan Millers Mutual Fire Insurance Company, was recently elected president of the International Association of Electrical Inspectors. He had been first vice president of IAEI for the past year.

After being graduated from Michigan State College with a B.S. degree in electrical engineering in 1914, he spent one year as instructor of mechanical engineering at the College. At the end of the year he started in the contracting business, installing electric wiring, hot water heating plants and farm electric lighting plants. In February of 1916 he became associated with the Michigan Millers Mutual Fire Insurance Company at Lansing as electrical engineer in charge of electrical inspections in flour mills and grain elevators throughout the state.

In 1923, Mr. Dendel became a member of the Electrical Committee, NFPA and has served on that committee since that time either as a member or alternate. He was president of the Michigan Association of Electrical Inspectors in 1933 and has been a member of the Executive Council, IAEI, since its organization. From 1938-1939 he was president of the Western Section, IAEI, and was elected fourth vice president of the international association in 1941.

FHA LOAN REPORT

More than 5,000,000 property owners have been enabled to make improvements, repairs and alterations amounting to almost $2,000,000,000 under the program of the Federal Housing Administration of the National Housing Agency, Raymond M. Foley, FHA Commissioner, announced recently.

The number of loans made by private financial institutions and insured under Title I of the National Housing Act increased almost 26 percent during the first six months of 1945 over the same period in 1944, while the dollar volume was up more than 43 percent.

These property repair and improvement loans are in addition to FHA's mortgage insurance program for the purchase and construction of homes now amounting to more than $6,000,000,000.

Actual figures at the end of June, when FHA rounded out 11 years of operations, showed that 5,042,790 Title I loans totaling $1,979,719,488 had been reported for insurance by qualified lending institutions.

Furthermore, Mr. Foley pointed out, Title I loans have played an important

role in the Government's campaign for fuel conservation through the FHA "Summer Plan" for insured-financing of installations to prevent heat losses. Under this plan, the first payment on insured loans to cover the cost of insulation, weatherstripping, storm windows or repairs to furnaces or heating systems may be deferred until November 1.

Under present regulations of the Federal Reserve Board, loans for less than $1,500 are repayable in monthly installments over a period of 24 months, dating from the time of the loan. On such loans made after November 1 for fuel conservation Federal Reserve Board regulations require repayment in 18 months.

Mr. Foley said that Title I should prove of great value as the building industry goes through the transition period from war to peace.

"There is a great backlog of needed repairs and improvements, which had to be deferred because of necessary wartime restrictions," he said. "As soon as these can be undertaken it will create a large number of jobs, and FHA is prepared to extend its aid to property owners and financial institutions in undertaking the task of rehabilitating the nation's housing supply."

It has been estimated that in the next 12 months property improvements and repairs probably will amount to abou $3,000,000,000, Mr. Foley said.

Title I operations are currently, and have been for some time past, on a self-sustaining basis and FHA has sufficient authorization from Congress under Title I to insure a financing volume estimated at about $1,000,000,000, Mr. Foley added. Its insurance authority under the Title extends to July 1, 1947.

RURAL LINE EXTENSION CONTRACTS AWARDED

The Rural Electrification Administration of the U. S. Department of Agriculture has reported the award of contracts for general construction of rural line extensions as follows:

Mississippi 23 Copiah — Southwest Mississippi Electric Power Assn., Lorman, Miss. has awarded a contract in the amount of $29,020.17 to the Line Construction Co., Clarksdale, Mississippi for the construction of 16 miles of 33 kv. transmission line. Cooperative will furnish the poles and conductors for lines and regulator, transformers, oil circuit breaker and poles for substation. Engineer: Bowman & Bowman, Greenwood, Miss.

Missouri 56 Sullivan—North Central Missouri Electric Cooperative, Inc., Milan, Missouri has awarded a contract in the amount of $163,523.40 to the Miller Construction Co., Inc., Linton, Indiana for the construction (labor and materials) of 160.25 miles of line to serve 337 members. Engineer: Frank Horton & Co., Lamar, Missouri.

North Carolina 38 Carteret—Harkers Island Electric Membership Corp., Harkers Island, N. C. has awarded a contract in the amount of $6,245.50 to the Durham







Electric Construction Co., Inc., Durham, N. C. for the construction (labor and materials) of 4 miles of 13.8 kv. delta transmission line. Engineer: L. E. Wooten, Longfellow Building, Raleigh, N. C.

North Carolina 49 Surry—Surry-Yadkin Electric Membership Corp., Dobson, N. C. has awarded a contract in the amount of $263,663.62 to the Rockingham Construction Co., Inc., 394 N. Main Street, Harrisonburg, Virginia for the construction (labor and materials) of 264 miles of line to serve 615 members. Engineer: B. O. Vannort, Charlotte, N. C.

Oklahoma 15 Tillman — Southwest Rural Electric Association, Inc., Tipton, Okla. has awarded a contract in the amount of $13,436.21 to the J & J Construction Co., Oklahoma City, Okla. for the construction (labor only) of 40 miles of line to serve 80 members. Cooperative will furnish all necessary materials. Engineer: Midwestern Engineers, 105 N. Boulder, Tulsa 3, Okla.

Oklahoma 22 Cotton—Cotton Electric Cooperative, Walters, Oklahoma has awarded a contract in the amount of $39,717.29 to the J & J Construction Co., Oklahoma City, Oklahoma for the construction (labor and materials) of 50 miles of line to serve 103 members. Engineer: Midwestern Engineers, 105 N. Boulder, Tulsa 3, Oklahoma.

Oklahoma 27 Bryan — Southeastern Electric Cooperative of Durant, Oklahoma has awarded a contract in the amount of $160,122.15 to J. Briscoe, Stillwater, Okla. for the construction (labor and materials) of 144 miles of line to serve 420 members. Engineer: Midwestern Engineers, 105 N. Boulder, Tulsa 3, Oklahoma.

South Carolina 29 Sumter—Black River Electric Coop. Inc., 13 Caldwell, Sumter, S. C. has awarded a contract in the amount of $1,841.11 to the Sumter Builders, Sumter, S. C. for the construction (labor only) of 7 miles of line to serve 18 members.

FHA POSTWAR LENDING

The Federal Housing Administration of the National Housing Agency enters the postwar period in a strong financial position to aid private enterprise in providing homes for America, FHA Commissioner Raymond M. Foley said recently.

FHA will be ready to back private lending institutions with authority to insure more than $2,000,000,000 in loans to help families build, buy or improve their homes.

In addition, by Act of Congress the President is empowered to extend to the FHA authority to insure another $1,000,000,000 for home financing.

Since it began operations FHA has helped more than 6,000,000 families to build, buy or improve their homes. Private financial institutions operating under the FHA program have advanced more

than $8,000,000,000 to make this possible. Over $3,500,000,000 of these loans have been liquidated.

The insurance authorizations which are available are about evenly divided between Title II operations, insurance of loans to build or buy a home, and Title I operations, insurance of property improvement loans.

At the end of June, FHA's estimated liability under Title II amounted to $3,039,800,133, leaving an estimated unused authorization of $960,199,867 which can be increased by $1,000,000,000 with Presidential approval.

FHA's authorization to insure loans on existing houses, its chief operation under Title II during the war, extends to July 1, 1946. There is no time limit on insurance of loans for new construction. During the fiscal year ending June 30, volume of insurance on existing construction set a five year record.

However, during the first six months of this year insurance of new construction loans under Title II was slowly increasing and at the end of June insurance had been written on 3,263 units of which 1,377 were insured in June alone. There were only 208 such units insured during 1944.

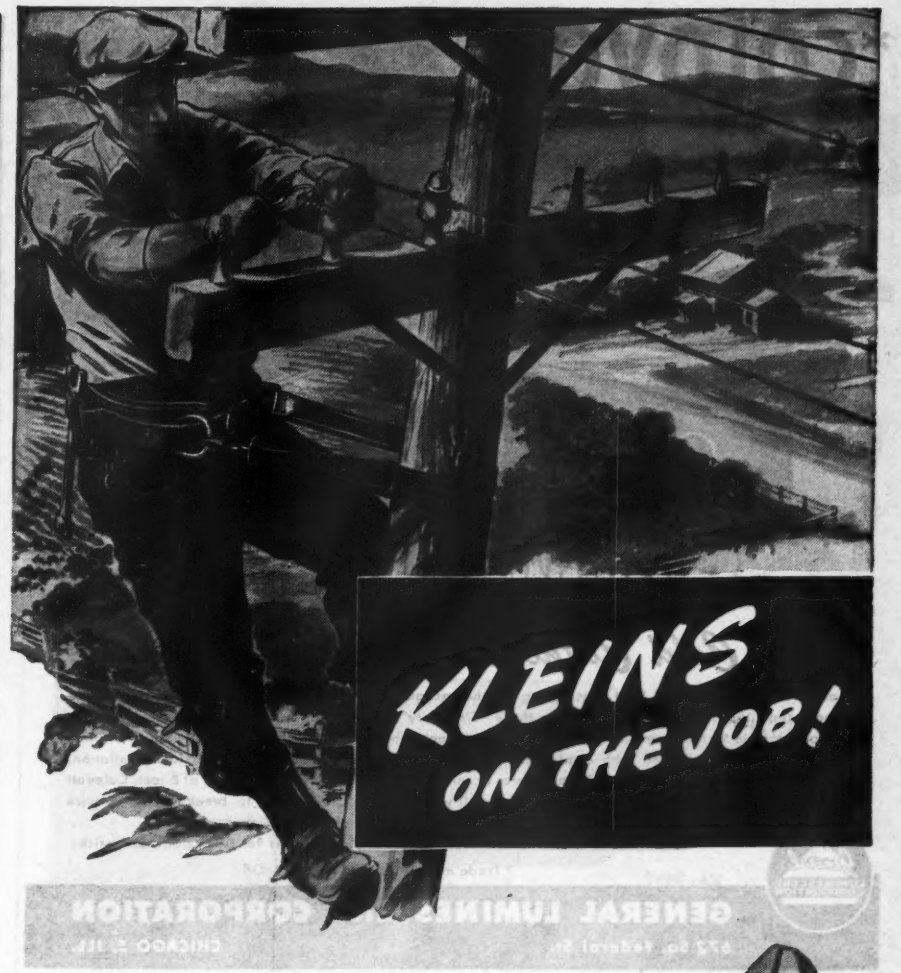
Title I operations, the insurance authorization for which extends to July 1, 1947, also showed a substantial increase during the first six months of the year and more than 5,000,000 such loans, amounting to around $2,000,000,000, have been insured since the start of the FHA program in June 1934.

Title II operations have been self-sustaining since 1940 and currently, and for some time past Title I operations have been likewise.

During the war period FHA operated principally under Title VI, a special amendment to the National Housing Act permitting insurance of wartime risks taken by private builders in constructing homes for migrating war workers. This program is in its final phases and some 434,000 units of war housing have been or will be produced under the program.



Wm. A. Ritt, secretary-manager of the Minnesota Electrical Council, demonstrates a simplified cost accounting system to Seymour Herz (center) Rochelles, Inc.; and Harry Burns, Modern Service Radio, after he addressed the Dealer Group of the Electric Association of Chicago recently.



● There's a mighty job to be done on the power and communication lines in America—improving present facilities—extending new lines to bring service to new users—both domestic and industrial.

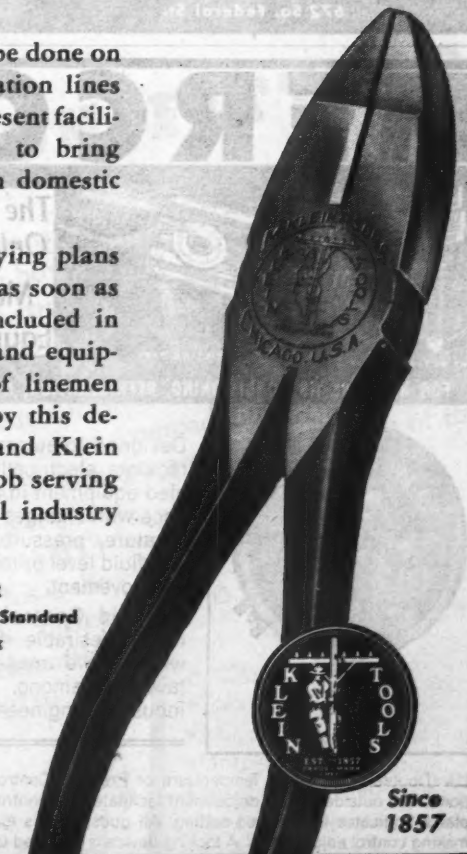
Utility companies are laying plans now to start this program as soon as conditions permit. And included in their plans are new tools and equipment for the thousands of linemen and electricians required by this development. Klein pliers and Klein equipment will be on the job serving these men in the electrical industry as they have "Since 1857."

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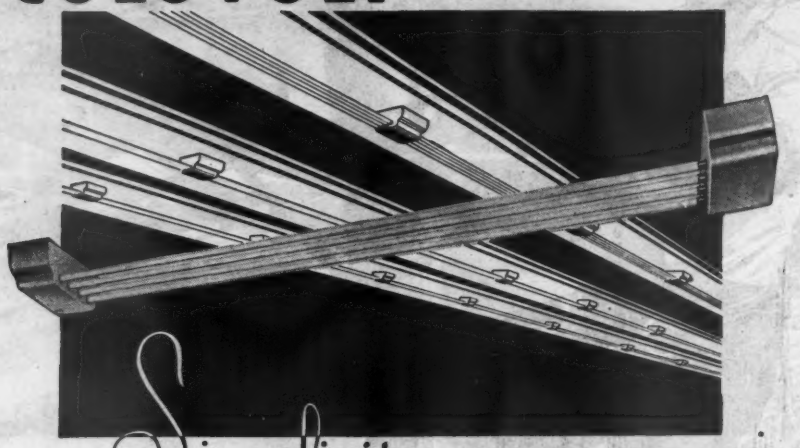


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Contact your electrical wholesaler or jobber, or write us for full details and prices.

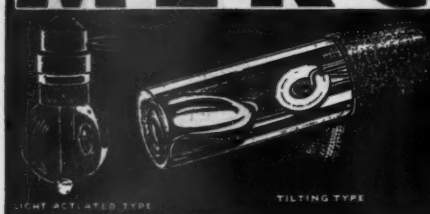
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The hermetically sealed mercury switches are dust and corrosion-proof. There is no open arcing, pitting or sticking of contacts. These switches assure better control performance and longer control life.

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See catalog No. 600 for complete information on all types of Mercoid Controls.

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LAMP LICENSE AGREEMENTS TERMINATED

The Westinghouse Electric Corporation announces cancellation of its lamp license agreements with the General Electric Company, effective August 1, 1945.

Ralph C. Stuart, Vice President in charge of the Westinghouse Lamp Division, Bloomfield, N. J., said the termination was effected by mutual agreement.

Under terms of the dissolution, each Company has granted the other a non-exclusive and unrestricted license entitling each to use lamp patents owned and controlled by the other up to and including August 1, 1945.

W. E. DAVIES HEADS NEW COMPANY

William E. Davies, formerly of the Gill Electric Company, has organized a new electrical contracting firm, known as Davies Electric Company. The new company has headquarters at 327 West E Street, San Diego, Calif. Mr. Davies has been active in the electrical contracting field in San Diego for the past 20 years.

Earl Myers, who has had 32 years of electrical contracting experience in the San Diego area, will be in charge as manager.

FEDERAL WAR CONSTRUCTION REPORT

Government-financed war construction, which reached its peak of $12,727,000,000 in 1942, has shown a steady and rapid decline in the following years despite the continuous rise in over-all Government expenditures during the war years, a recent WPB analysis indicated.

The construction figure, which includes industrial construction with machinery and equipment, non-industrial military, war housing and community facilities and service construction, started its climb in the last six months of 1940 with a modest total of $790,000,000. In 1941 this figure had jumped to $4,918,000,000. After the 1942 high mark had been reached, however, 1943 saw a decline to $8,457,000,000 and in 1944 there was a sharp drop of more than 65 per cent under 1943 to a total of $2,949,000,000.

In contrast to this, but largely because of the sharp rise in the construction curve before the end of 1942, production of war materials has shown a steady rise.

Production lines had already rolled off to what seemed a good start in the last half of 1940 when $1,995,000,000 worth of munitions was manufactured. "Munitions" cover, besides ammunition, guns and fire control, such things as aircraft, ships (naval, transports and freighters) combat and motor vehicles, communica-

tions and electronic equipment, and military clothing and equipage.

In 1941, with war construction work gathering momentum, the total munitions production figure was $8,399,000,000. In 1942, however, the country was beginning to hit its stride, and $31,229,000,000 worth of production poured from mill, factory and shipyard. This figure too was pushed into the discard when the 1943 results, $55,185,000,000, were made known, and in 1944, with war construction less than a fourth of what it had been in 1942, the country's productivity was reflected by a figure of $59,926,000,000.

Some comparisons in the breakdown of these figures between the years 1942, when war construction hit its peak, and 1944, when war production reached a ceiling reveals how completely their dollar value curves reversed each other, WPB said. Industrial construction (including machinery and equipment) in 1942 totaled $6,414,000,000 and in 1944 had tapered off to $1,723,000,000. Non-industrial (military), not far behind industrial, totaled $5,060,000,000 in 1942 and in 1944 was down to $720,000,000.

In contrast to these figures, in 1942, production of aircraft totaled $6,095,000,000, but in 1944 the production had risen to $16,046,000,000. The production of ships, which was $7,322,000,000 in 1942, had nearly doubled in 1944; production of ammunition, $2,998,000,000 in 1942, had more than doubled itself by 1944, and almost the same ratio held good in guns and fire control and in other categories, WPB said.

RITT APPOINTED TO MINNESOTA S. B. COMMISSION

William A. Ritt, owner of an electrical contracting and appliance business in St. Peter, Minn., and secretary-manager of the North Central Electrical Industries, Minneapolis, was recently appointed by Governor Thye as a member of the Minnesota Small Business Commission. Other commission members representing small business are George Herried of Dee River and Paul Lambert of St. Paul.

The commission was created by the 1945 legislature to study the problems of small business and recommend a program to prevent or effectively minimize small business failures. Specifically, the commission is instructed to study discriminatory trade practices which adversely affect small business; devise vocational training programs to equip the personnel of small business to meet changing economic conditions; study programs designed to aid the returning veteran in entering the field of small business; and consider the advisability of establishing a department of commerce whose duties would be to administer and enforce all state laws pertaining to trade and commerce within the state of Minnesota. The findings of the commission are to be submitted to the 1947 legislature for appropriate action.

Legislative representatives on the commission will be Senators Sletvoldt, Detroit Lakes; Simonson, Litchfield and



EXPANSION FITTINGS

To compensate for the expansion and contraction of conduits terminating in a junction box, specify O.Z. Type "EXE". For continuous runs of conduit provide for expansion and contraction by specifying O.Z. Type "EX". Expansion head is sealed against moisture by high grade packing. Interior Bakelite bushings prevent abrasion of cables.

Where a shorter and more compact fitting is required specify Type "AX" which incorporates the principles of the Type "EX" but has fewer parts.

For thin wall conduit (EMT) use our Type "TX". This is the same as the Type "AX" fitting except that it has extending nipples for attaching to thin wall couplings.



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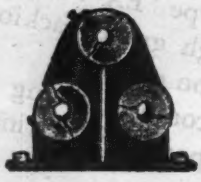
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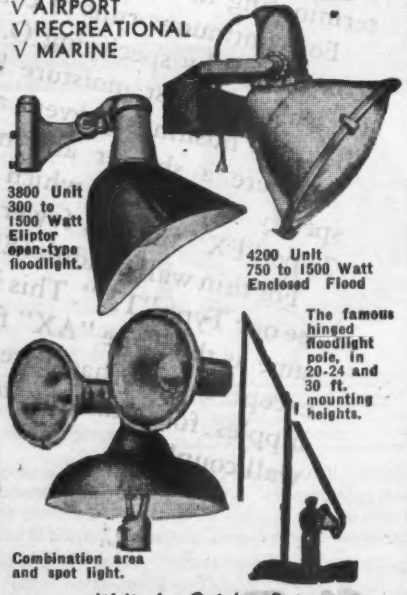
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Baughman, Waseca. House members of the commission will be Representatives French, Minneapolis; Allen, St. Paul; and Windmiller, Fergus Falls.

U.S. C. OF C. ISSUES REPORT ON PUBLIC WORKS

Using public works construction as an economic balance wheel is an idea seldom understood in all its implications, according to the Chamber of Commerce of the United States. Major potentialities and pitfalls of this proposal are examined in a report, "The Use of Public Works to Sustain Construction Activity," issued by the Chamber's Construction and Civic Development Department.

In normal times, the National Chamber points out, new construction by both public and private agencies adds up to approximately 12 percent of the national income. Of this, about one-third is initiated by some governmental agency—federal, state or local. Thus public works ordinarily account for only about 4 percent of the total economy.

It is obvious that variation of so small a segment cannot be expected to exercise any appreciable effect upon the whole structure of American employment. Nor could much more be expected by including private construction, which would bring the total up to about 12 percent, plus from 2 to 4 percent more if expenditures for repair, maintenance, and remodeling were included. Construction can make its most effective contribution toward stability, according to the National Chamber, through measures designed to sustain its own volume so far as that is practicable.

Even with this more limited goal, it is stated, public works alone cannot carry the entire burden of stabilization. Private construction, which accounts for two-thirds of the total, must be encouraged to maintain a steadier flow of investment funds into new structures and improvements of existing structures.

The Chamber also stresses the need for more study of the possibility of advancing and retarding public works. Because the decision when to construct such undertakings rests with government agencies, it is often assumed that public works can be planned in advance and then "laid on the shelf" until a propitious time for actual construction to begin. But many public works are complementary to private construction. For example, when private residential building is active the need is greatest for street improvements, public schools and playgrounds, and extensions to water and sewage systems. To hold these back would be to hamper private construction. There is need for careful study to determine just what public works can be held back, and for how long, without causing more harm than good. Further data should also be obtained to show the effect of such holdups on employment and materials production.

Furthermore, there are numerous legal

and administrative obstacles in the way of coordinated control of public works. Governmental construction projects are planned and executed by a number of federal agencies and by literally thousands of state and local bodies. There is at present no effective coordination of the policies of these numerous groups with a view to either advancing or retarding public works in the national interest.

Current measures taken by both state and federal governments to stimulate the immediate preparation of engineering and architectural plans for postwar construction can have an important bearing on the long-term problem of using public works as a stabilizing factor in the construction industry, the National Chamber believes. The long-term aim should be to create the maximum flexibility in scheduling public works to overcome to the extent practicable the past practices that resulted in having public works pressing forward when private work was at a peak, and vice versa.

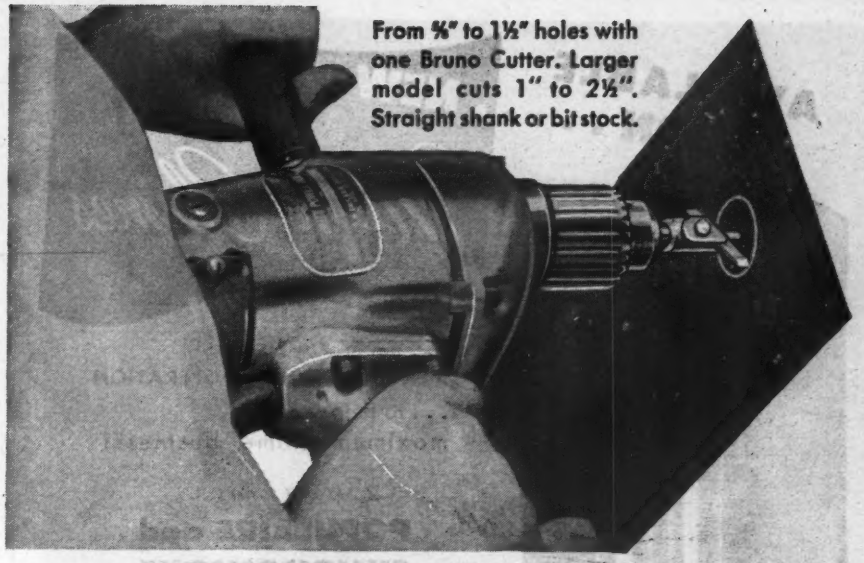
WISCONSIN 4-H'RS LEARN ABOUT ADEQUATE WIRING

A three-star troup that made history in pioneering elementary appreciation of rural electrification recently returned from a 1,700 mile jaunt throughout the state of Wisconsin visiting six 4-H Club Leader Training Camps. To some 600 farm boys, girls and adults plus county agricultural agents, they brought the story of electricity in the home and on the farm; adequate wiring and fusing; requirements of good lighting; selection and maintenance of appliance cords; how to build homemade chick and pig brooders when necessary.

Four hour-long classes were conducted by Miss Evelyn Evert, A. J. Von Burg and B. J. Auchter for the Wisconsin Utilities Association. Conducting the first hour of the class, Miss Evert of the Wisconsin Electric Power Company taught the need for adequate wiring and fusing. With the aid of demonstration equipment she showed the effects of inadequacy and adequacy on efficient use of electricity and appliance operation concluding with a discussion of how to select and replace fuses. With the aid of charts, Mr. Auchter of the Wisconsin Gas and Electric Co., explained wire construction and pointed out the various kinds of wire that should be used.

The second hour, conducted by Mr. Von Burg of the Wisconsin Power & Light Company was devoted to contrast demonstration of good and poor lighting. Emphasis was placed on the need for purchasing correct voltage lamps; selection of the proper amount and quality of light; effects of bare lamps, shades and reflectors. Visualizing the economy of good lighting he gave sight tests and wound up his presentation with a demonstration of fluorescent lighting.

The rest of the four-hour session was devoted to instruction in the selection and repair of cords—in which the "students"



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No. 100
⅝" to 1½"

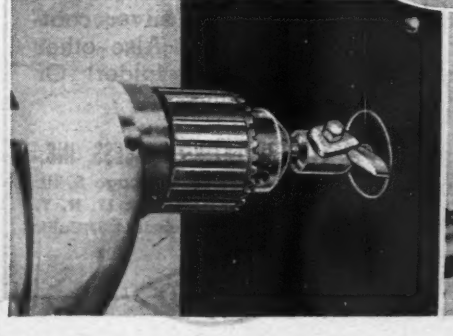


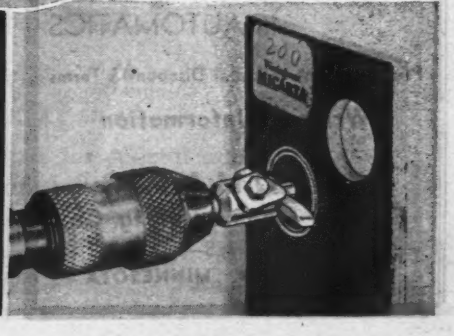
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Ideal for electric drills and light drill presses.

Cuts deep holes in wood or compressed material





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RAPID

actually participated—and a discussion of the efficiency of electric brooders. The proper method of making safe home-made brooders, in case farmers could not secure them on the market, was outlined.

MORE POWER TO AMERICA

A long-range plan calling for unified action by electric power companies, machinery manufacturers, and electrical manufacturers, and designed to accelerate the mechanization and electrification of American industry and farming in the postwar era was announced recently by Charles E. Wilson, president of the General Electric Company.

Labeled the "More Power to America" program, the plan comprehends many months of research field investigation, and analysis by G-E industrial engineers, and cooperation by representatives of other industries. During the past several months the program has been informally presented to hundreds of business leaders throughout the country in order to obtain their reactions and criticisms.

The major benefits that can accrue from such an accelerated modernization plan, Mr. Wilson said, are three in number:

Put into action widely, the program would facilitate the reconversion of industry on a soundly engineered basis, to insure costs that will enable businesses to compete successfully in the domestic and export markets;

It will improve peacetime industrial operations and the American standard of living by increasing earnings and the productive ability of the workers;

Finally, it will help maintain the United States as a potential military and naval power by strengthening productive capacity.

Incidentally, putting the plan into action will bring to all kinds of small businesses a sizable amount of technical know-how from big business which has never been readily available before, Mr. Wilson said, since the keystone of the plan is the aggressive application of modern engineering, mechanization, and electrification practices to small plants.

CANADA PLANS RURAL ELECTRIFICATION

An electrical project which will ultimately involve some 63 millions of dollars is being planned by the Ontario, Canada, hydroelectric power commission, according to a report by the Commerce Department in Washington. The project will be started as soon as materials and labor are available.

Included in the program will be the construction of 7,330 additional miles of rural lines to serve 58,000 new customers —32,000 of these being farmers. At the completion of the project, 85 percent of the farms ultimately to be served by the power commission will have electric service.

It is estimated that rural consumers will spend 41 millions of dollars for wiring

and purchases of electrical appliances and heaters. It is anticipated that 90,000 electric irons, 24,600 refrigerators, 95,500 radios; 18,800 electric ranges; 58,500 washing machines; as well as other equipment will go on the lines during the five-year plan of the commission.

MINN. ELECTRICAL COUNCIL MEMBERS GET ADVERTISING SERVICE

The opening gun in the Minnesota Electrical Council's postwar advertising and sales help program for members was fired recently when the first of a series of advertisements on fluorescent lighting installations was made available in mat form.

The ready-made ads publicize the fact that fluorescent lighting fixtures may now be purchased and installed on existing outlets without a preference rating or special permission from WPB. They also emphasize the contractor-dealer's ability to plan the complete installation, to help with the selection of the proper fixture, and to render service whenever needed. The three-column by five-inch ads carry illustrations of standard types of fluorescent fixtures of the latest design.

As a part of this campaign to direct prospective buyers of fluorescent lighting equipment to a qualified, local source, the Minnesota Electrical Council will also process sales letters for members to send to their fluorescent lighting prospects.

MINNESOTA CO-OP'S PLAN NETWORK OF RURAL LINES

A recent report of the Minnesota Electric Cooperative Association of St. Paul, reveals that the postwar planning committee of the Minnesota REA Cooperatives has projected a line construction program designed to bring electric service to 57,700 new customers. The gross dollar amount of business this program will produce is estimated at $62,946,500 of which $31,500,000 will be spent on a three-year line expansion project of the 51 cooperatives in the state. The rest of the business will come from wiring and appliance sales —within three years after electric service is made available—in accordance with the following estimated breakdown:

57,000 new consumers—wiring at $145 each	$ 8,366,500
57,000 new consumers—appliances at $400 each	$23,080,000
Total	$31,446,500

The report reveals that the procedure followed by REA cooperatives in the past has been the building of main lines (most of them being completed) naturally located in thickly settled territory. Up to the present this program has resulted in the electrification of approximately 40 percent of the farms in Minnesota. The work of the future consists of establishing



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A FAIR Sales Policy

SORGEL AIR-COOLED TRANSFORMERS

Save money for the user and are profitable for contractors to install.
Designed for efficient operation and continuous hard service.
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Floor or wall mounting—no extra brackets.
Single or poly-phase units. No complicated connections.
For conduit wiring.

A size and type for every purpose.
¼ KVA to 1000 KVA. All voltages.

Many standard types. Special types for special applications.
High-voltage Air-cooled transformers for indoor sub-stations.

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Pioneers in the development and manufacturing of Air-Cooled transformers.

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a network of branch lines to serve the 60 percent of the farms still eligible for and vociferously requesting electric service. The funds for the $31,500,000 line expansion will be borrowed by the cooperatives with the obligation of complete repayment of the sum being assumed and borne by those receiving the services.

The report states that private enterprise in Minnesota will benefit to the extent of the $62,946,000 (line construction, wiring and appliances) and that the expenditure of this sum will provide 22,000,000 man-hours of labor.

J. D. KEENAN TO SPEED CONSTRUCTION

Moving swiftly to enable industry to carry out its program of $4,500,000,000 for new plant, equipment and alternations in the shortest possible time, J. A. Krug, Chairman of the War Production Board recently appointed Joseph D. Keenan, the Board's Vice Chairman for Labor Production, to spearhead the gigantic construction program.

In his new position as Special Assistant to the Chairman in charge of construction, Mr. Keenan will speed-up construction activities necessary for reconversion and will represent WPB on the Inter-Agency Committee for Construction, recently established by the Office of War Mobilization and Reconversion.

"Particular emphasis will be placed by Mr. Keenan on industrial construction, so that manufacturing activities can be expanded without delay and jobs opened up for returning servicemen and for workers as they are released from war production," Mr. Krug said, "Mr. Keenan has served as the Board's Vice Chairman for Labor Production since May 1943, and has recently returned from Germany, where he was Deputy Director of the Manpower Division of the U. S. Group Control Council for Germany."

Pointing out that the chief factor now retarding construction is lack of materials and equipment, Mr. Krug stated that Mr. Keenan's major immediate assignment will be to assist in stepping-up production of these scarce construction materials. The supply situation for construction materials is expected to ease as a result of military cut-backs and relief of manpower shortages. Lumber, cast iron soil pipe, brick, hardboard and certain types of steel have been critically short, but should ease up shortly as the WPB drive for increased production gains headway.

Mr. Keenan's background in the labor field, and long association with the building trades, suits him admirably for the assignment of increasing production of bottleneck items.

As Associate Director and later Director of WPB's Labor Division, and as Vice Chairman for Labor Production, Mr. Keenan has worked in close cooperation with labor, has been concerned with labor problems affecting critical war programs, and has been active in the recruitment of necessary manpower for construction programs essential to carrying on the war.

How to draw clear, accurate circuit diagrams and wiring plans



This book gives you tested drafting techniques needed in engineering and contracting, as applied to electrical circuits and wiring plans. In a progressive series of drawing plates and explanatory discussions, the book shows how to develop detailed wiring plans from the schematic circuit diagram, how to correlate the equipment-location plan, and how to check the design and execution of the finished drawing.

Get the benefit of years of drafting experience in many electrical fields to turn out better, more accurate diagrams and wiring plans.

Just Published!

ELECTRICAL DRAFTING

By D. WALTER VAN GIESON

Assistant Electrical Engineer, Board of Transportation, City of New York

140 pages, 5¼ x 8¼, $1.50

In this unique presentation, the author describes and explains drawings taken from actual working installations to show typical applications in such fields as lighting, railway signals, communication, radio and television, and power—and including as well car, aircraft, and ship wiring plans, traffic signals, animated signs, and neon and fluorescent lighting. Besides treating the procedure for developing detailed wiring plans, the book explains the correlation of equipment-location and conduit-location plans, and discusses in detail how to check the finished drawing for proper design and correct execution.

The book gives you—

- **—valuable material on the principals of electricity and electronics**
- **—useful data, specifications, and rules**
- **—six pages of electrical symbols used in drafting circuits and wiring**
- **—helpful tips on some of the "kinks" and shortcuts in drafting room procedure**
- **—practice problems and test questions**

Special attention has been given to recent advances in electrical drafting. Modern methods and symbols are introduced early in the book and are adhered to throughout. Points out small but important "tricks of the trade" that you might otherwise overlook, or have to learn yourself, the hard way.

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REA LOAN ALLOTMENTS

Rural Electrification Administrator Claude R. Wickard has announced loan allotments totaling $4,371,499 to 23 rural electric cooperatives in 18 states.

The borrowers and loan amounts are listed below. Unless otherwise noted, the funds will be used for line construction to extend electric service in the system's area.

Alabama—Sand Mountain Electric Cooperative, Fort Payne, $350,000.

Delaware—The Delaware Rural Electric Association, Greenwood, $163,000.

Florida—Tri-County Electric Cooperative, Inc., Madison, $50,000.

Georgia—Troup County Elec. Membership Corp., La Grange $85,000, which includes funds for the acquisition of 38.5 miles existing line.

Illinois—M. J. M. Electric Cooperative, Inc., Carlinville, $225,000.

Indiana—Warren County Rural Electric Mbr. Corp., Williamsport, $60,000.

Indiana—Daviess-Martin County Rural Elec. Membership Corp., Washington, $210,000.

Iowa—Woodbury County Rural Elec. Coop. Assoc., Moville, $110,000.

Louisiana—Concordia Electric Cooperative, Inc., Ferriday, $80,000.

Michigan—Western Michigan Elec. Coop., Scottville, $65,000.

Missouri—Crawford Electric Cooperative, Inc., Bourbon, $340,000, including the assumption of $200,001 loan allotment for construction of lines previously planned by another Rural Electrification Administration borrower.

Missouri—Mt. Vernon Electric Refrigeration Coop., Inc., Mt. Vernon, $7,000 to cover increased costs and for the installation of sewage disposal plant and driveways.

New Mexico—Otero County Electric Cooperative, Inc., Cloudcroft, $125,000.

North Carolina—Woodstock Elec. Mbr. Corp., Belhaven, $155,000.

North Dakota—Baker Electric Cooperative, Inc., Cando, $190,000.

Oklahoma—Cimarron Electric Cooperative, Kingfisher, $300,000.

South Carolina—Lynches River Electric Coop., Inc., Pageland, $432,000, which includes $36,822 for system improvements.

South Carolina—Horry Electric Cooperative, Inc., Conway, $234,000.

Tennessee—Gibson County Electric Mbr. Corp., Trenton, $690,000, which includes $400,000 to refinance previous indebtedness to TVA.

Tennessee—Sequachee Valley Electric Cooperative, South Pittsburgh, $570,000, which includes $520,000 to refinance previous indebtedness to Tennessee Valley Authority.

Texas—McCulloch County Electric Cooperative, Inc., Brady, $70,500, which includes $20,500 for the acquisition and rehabilitation of existing facilities.

Texas—Wood County Electric Cooperative, Inc., Quitman, $50,000.

Virginia—Northern Neck Electric Cooperative, Warsaw, $10,000 for purchase and rehabilitation of office headquarters.



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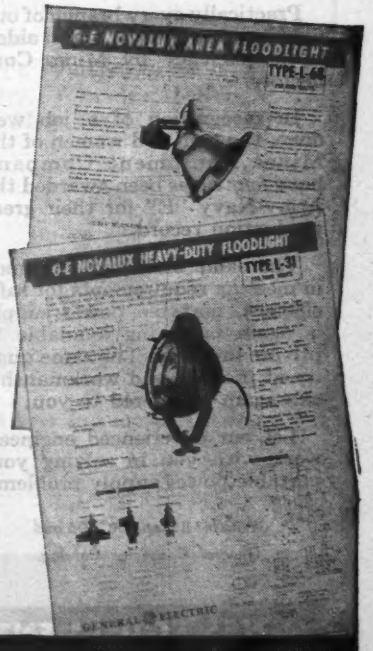
...and get these important advantages

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FLOODLIGHT	PUBLICATION
Heavy-duty, steel casing	
200 or 250 watts, Type L-29	GEA-4303
300 or 500 watts, Type L-30	GEA-4304
750 or 1000 watts, Type L-31	GEA-4305
Heavy-duty, cast aluminum	
200 or 250 watts, Type L-38	GEA-4325
General purpose, sheet aluminum	
300 or 500 watts, Type L-49	GEA-4311
750 or 1000 watts, Type L-43	GEA-4310
Sports and area, sheet aluminum	
750 to 1500 watts, Type L-68	GEA-4333
Area, open porcelain enamel	
300 to 1500 watts (Type L-45)	GEA-4433
(Type L-46)	GEA-4432
Handy, sheet aluminum	
200 watts, Type L-66	GEA-4346
Underwater	
100/250/400 watts (Type L-33)	GEA-4438
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The tough usage of war has demonstrated the adaptability of Mines Molded Rubber Cable Connectors in Army and Navy use. Millions of these rugged connectors have been used all over the world — on Land and Sea.

Many types and sizes of Mines Connectors have been supplied in the war-time production drive for efficiency. Among them were Single Conductor and Multi-Conductor for all types of application — low amperage for electronic detectors and measuring instruments, naval shore installations and forces afloat, air force ground equipment and aircraft components, telephone and radio communication equipment.

Practically every branch of our fighting forces has been aided in its efficiency by Mines Connectors.

In recognition of a job well done, the men and women of the Mines Equipment Company have *four times* been awarded the Army-Navy "E" for their great production record.

The same skill and efficiency in meeting requirements for safe, efficient, portable power supply is again becoming available to private industry. The same quality of product and workmanship can again be offered to you.

Let our experienced engineers work with you in solving your portable power supply problems,

Write for Bulletin MC-106 and General Connector Catalog.

MINES EQUIPMENT COMPANY

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OPA'S FIVE-POINT PEACETIME PROGRAM

Chester Bowles, head of the Office of Price Administration, recently announced his agency's five-point program for carrying out OPA's part in the government plan to stabilize the national economy during the transition period. He called for cool heads and continued cooperation of business, workers, farmers and consumers to see the stabilization job through.

The price administrator said that there is a "dangerous gap between sudden victory and sound prosperity—but we are going to get across it, and I believe price control is the center span in the bridge.

"Right now, our fighting men have a right to our strongest assurance that they will return to the security they have fought for.

"At this crucial time workers are entitled to our assurance that they will not have to pay higher prices for the food and clothing they are going to need in the next few months.

"Right now, farmers in every section of the country deserve to know that their costs are going to stay on an even keel.

"Right now, 44,000,000 people who live in rented homes and apartments are entitled to the Government's guarantee that there will be no unnecessary rise in their monthly rent.

"And right now every business man is entitled to feel sure that the general level of materials prices is going to be kept stable.

"And we must keep faith with bondholders and the millions who live on fixed incomes by seeing to it that the value of their money is preserved.

"All six of these groups deserve the best protection that we can get out of a sound price structure on which we can build a sound prosperity. I want them to know that OPA is going to use every resource at its command to make price control work for the good of industry and consumer alike

"Our economic fumbling right after the last war delayed orderly peacetime reconversion for more than two years. First of all, right after the Armistice was signed, prices of some things sagged a bit under the shock of cutbacks. Three months later the prices started shooting upward with wages tagging along behind as usual.

"We weren't prepared for that inflationary spiral and we weren't able to head off the disastrous collapse that came sixteen months later. That disaster brought suffering and misery to millions of business men, farmers, workers, and veterans who had come home expecting a good job. We cannot afford to fumble again.

"Very likely during the next few months, as during the winter of 1919 buying of some items may slow down while workers are shifting from war work to peacetime jobs. Temporarily this may cause some prices to ease downward. Just at that stage many people may feel as they did after the Armistice in 1918 that all danger of inflation has passed. Danger, however, will hang over us until recon-

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NEW BATTERY-VIBRATOR TYPE

No more tiresome cranking of a hand-driven generator. Entirely self-contained. Steady test potential of 500 volts D.C. available at the touch of a switch. Direct reading in insulation resistance. Various new models and ranges.

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Test-O-Lite

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100 to 550 Volts, A.C. or D.C.
Safely, Swiftly, Surely



THE NEON GLOW LOCATES TROUBLE INSTANTLY

Indicates hot or grounded wires. Tells AC from DC. Far superior to ordinary clumsy test bulb. Indispensable in shop or home. Has PATENTED safety features. Vest pocket size.

Life time guarantee. List $1.50. Purchase thru electrical dealers.

RTC-2 VINCENT RARE GAS RELAY



for harmonic or coded bells. Dual purpose device which economically improves both ringing and transmission on party lines. NO MOVING PARTS. Fully guaranteed. Can be installed in a minute.

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version is in high gear and goods are flowing freely. If we allow ourselves to be deceived by a temporary lull and if we relax our vigilance, we may well lose at the very last moment the basis for a sound postwar prosperity.

"Our program during the next six months must be a skillful combination of firm courageous control in those areas where they are needed to curb inflation, together with flexibility, speed, relief from individual hardships, and prompt de-control when there is a safe balance between supply and demand.

"We all are weary of the restraints and restrictions and controls that have been necessary during the war period and we are not going to continue any control for control's sake, but we are going to keep a firm grip on controls that are essential to hold down the cost of living and hold down business costs."

Mr. Bowles outlined the five steps that the Office of Price Administration is going to take:

"1. We are going to keep the lid on food prices. For nearly every American family the biggest single item of living expense is food. I think the least that the stabilization program must assure every family is that food prices will not move up.

"2. Many clothing prices are too high. However, as a result of the Government's clothing program, more and more low-priced clothing is beginning to show up in the stores. I am confident that the benefits of the clothing program can soon be spread more widely. The end of the war will sharply increase civilian supplies of most textiles. In addition, the President has ordered the allocation of scarce materials necessary for the production of low-priced items, which are essential to the continued success of the stabilization program.

"As a result I think we can be reasonably assured of a rapid improvement in the quantity and quality of clothing on the market, particularly for women and children, during the next six months, and the price is going to be right.

"3. Final victory makes machines, workers, and materials available for rapid return to the mass production of automobiles, refrigerators, vacuum cleaners, washing machines, electric irons, and many other things, which we have not been making since 1942. People who have been doing without these necessities for a long time are entitled to the opportunity of buying them at prices they can easily afford. The workers who are going to make them are equally entitled to good wages at peacetime jobs. Business is certainly entitled to expect a fair profit on a good volume of production. All these objectives can be met under our reconversion pricing policy and most of the products will come back on the market at or close to retail prices that prevailed during the 1942 period.

"Our pricing policy must be flexible. Above everything else it must be administered with speed and efficiency. Business large and small, must be relieved of all unnecessary red tape. To help accomplish this reconverting firms doing under $200,000 worth of business a year

THE REFLECTOR IS THE BACKBONE OF ANY LIGHTING SYSTEM . . .



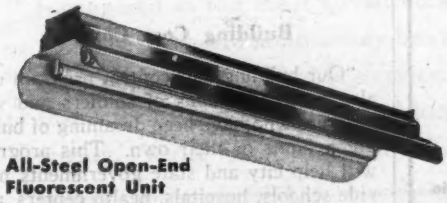
Skilled Lighting!

Helps make Skilled Hands!

Skilled work thrives on *Skilled Lighting.* Down goes the costly record of errors often due as much to blinding glare as uncertain shadow. Up goes production, both in quality and quantity, thanks to evenly distributed, shadow-free *Light* – the kind that Wheeler engineering has made famous throughout industry!

Better work and reduced costs are practically automatic when you install Wheeler Reflectors – the product of 64 years of specialized lighting experience. For they are engineered to get maximum illumination from *standard lamps.* And because of their efficient design, heavy duty materials, and high grade vitreous enameling, they stand up longer, require less maintenance.

Learn how you can lighten the load on your workers – and your operating costs. Send for catalogs showing complete line of incandescent and fluorescent lighting fixtures. **Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.** Also New York. Representatives in principal cities.



All-Steel Open-End Fluorescent Unit

Available for two or three 40-watt, or two 100-watt lamps. Broad wiring channel with accessible, enclosed ballast. Can be mounted from chain or conduit, individually or in continuous runs.



RLM Solid Neck Incandescent Reflector

Maximum lighting efficiency for either indoor or outdoor use. Expertly designed, ruggedly built. 75 to 1500 watts.

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Without disturbing Conduit

Only with Kondu can you take out one fitting and put in another, without disturbing conduit. Every Kondu box is a union.

Only with Kondu can you use ANY kind of conduit at ANY outlet.

Vibration - proof, Kondu holds permanently tight. Practically unbreakable — 100% re-usable. *Write for the Kondu Catalog.*

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Erie, Pa.
KONDU MFG. CO. LTD., Preston, Ontario

KONDU



will operate under automatic pricing procedures.

"Individual adjustments for companies both large and small must be made to fit unusual conditions.

"For speedy handling, fully 90 percent of all individual firm price adjustments will be delegated from Washington to our field offices. Procedures will be streamlined so far as feasible to meet the conditions.

"4. Families who live in rented dwellings must be protected against any unnecessary inflation of rentals. Millions of workers are going to be looking for new places to live. Returning veterans and their wives will need houses or apartments while they are getting re-established in their civilian lives. To safeguard their futures we are going to hold rent controls firmly until tenants have the opportunity to bargain with their landlords as they did before the war. We will be able to lift area rent controls section by section as soon as there are enough dwellings in each area to satisfy the demand for living quarters.

"We have been alarmed by the growth in the number of workers who have been evicted from their homes on flimsy pretexts. Soldiers' wives have been told by their landlords that they either had to buy the home at inflated prices or get out. These unfair practices must be halted at once. They have added one more great measure of insecurity in the lives of too many people.

"We are determined to take vigorous action to put a stop to trumped up, heartless evictions. We have called in the real estate trade for immediate consultation to consider particularly changing the period required for notice of eviction from 90 days to six months. A specific program putting our plans into action will be released in about two weeks.

"Our forthcoming program of dollar-and-cent prices on many building materials and services will help landlords to maintain and build dwellings at costs that will keep present rentals profitable. This program will also help keep rentals from being forced to abnormally high levels from which they would have to crash later.

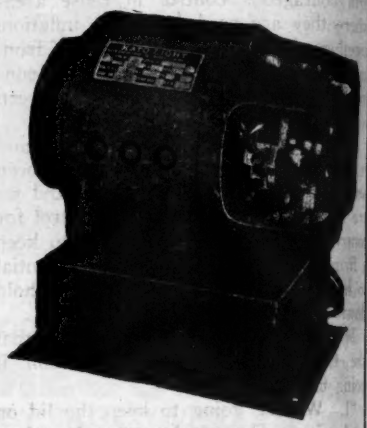
Building Cost Control

"Our building cost control program will also protect millions of soldiers and war workers who have been dreaming of building a home of their own. This program will help city and state governments provide schools, hospitals, health centers, and public buildings at reasonable costs to taxpayers. It will help keep tax rates and public debt burdens down.

"5. In our effort to hold down the costs of food, clothing, reconversion goods, and rentals during the transition period, we want as few rules and regulations as possible. All unnecessary restrictions will be weeded out. But the rules that stay to guide us through this dangerous period must be vigorously enforced. Let there be no misunderstanding of OPA's intention to vigorously emforce the price and rationing controls as long as they are on the books. If we did anything less, we

110-Volts A. C. from Direct Current

with KATOLIGHT ROTARY KONVERTERS Change 32, 110 or 220 volts D.C. to standard 110-volt, 60-cycle A.C. for operating radios, electronic & sound apparatus, electric signs, A.C. appliances, etc.



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Also manufacturers of A.C. and D.C. generators ranging from 350 watts through 25 K.W.; power plants; Frequency Changers; and Motor Generator Sets.

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FOR INDUSTRIAL USE

• Recommended for use where *Long Life* is essential, where *Vibration* is excessive, where *Inaccessibility* of lighting fixtures makes *Replacement Difficult*, where a *Pilot Light* is needed.

Available in a wide variety of sizes, shapes, candle power and voltages – standard and candelabra bases.

A large supply of all standard types are carried in stock, thus assuring you prompt service at all times. Write for catalog sheet 1-2 for full details or see your Electrical Wholesaler.

NORTH AMERICAN ELECTRIC LAMP CO.
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would be denying the public the safeguards which the stabilization program promises. If we did not see to it that black marketeers are rounded up and given stiff jail sentences, honest business men would be denied their rightful protection from unscrupulous competitors. Our enforcement actions will be stepped up to the limit of our manpower, and the weight of our enforcement will be shifted to price control as we are able to drop rationing programs one by one. The Attorney General has told me that OPA will receive the fullest support of his office in carrying out its enforcement program.

99,638 POSTWAR CONSTRUCTION PROJECTS SPOTTED IN THREE-YEAR SURVEY

Thomas S. Holden, President of F. W. Dodge Corporation, reported recently that his organization's field staff by the end of May had spotted 99,638 specific construction projects contemplated for postwar execution in the 37 states east of the Rocky Mountains. The combined value of all projects is $15,746,202,000. Mr. Holden emphasized that the listings included specific projects only, and do not include announcements of general construction or expansion programs.

The Dodge executive declared that the information was obtained in continuous surveys from more than a million individuals, companies, institutions, and government agencies, and represents the cumulative and unduplicated reports of his field staff over a three-year period. While 99,638 projects are listed, the number of buildings involved is much greater, for many projects involve more than one structure, Mr. Holden said.

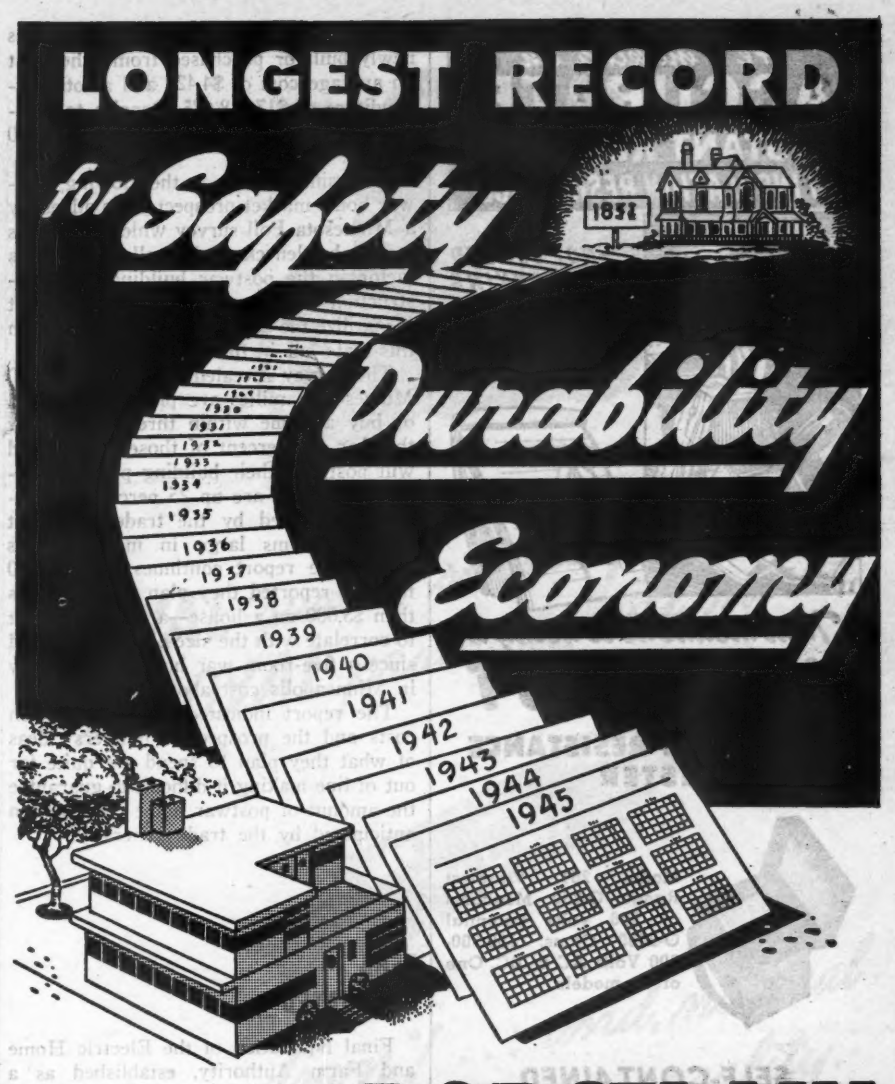
MINNESOTA CITIES SURVEY POSTWAR MARKET

If buying intentions now in the minds of 27,000 Duluth, Minn., families are carried out during the first two postwar years, more than $40,000,000 worth of retail business will be done in automobiles, new homes, refrigerators, washing machines, and other consumer items now off the market. Such was the information contained in a report of the Duluth Committee for Economic Development which reviews postwar employment, financial conditions, markets, agriculture in St. Louis County, and home building.

Of interest to the electrical industry, is the following abstract of electrical items taken from a table indicating what Duluth families plan to buy, the average cost of the item, and the anticipated volume of business.

How will these purchases be financed? An analysis contained in the report indicates that 50 percent of the families intend to use current income; 30 percent installment credit; 10 percent war bonds; and 10 percent cash savings.

For the forefront of postwar desires



Wire with PORCELAIN

● In the past two decades billions of knobs alone have been used in electrical wiring—proof of the wide acceptance of the Knob and Tube wiring method. This system has been improved and perfected in the PORCELAIN Protected Wiring System which is now recognized as the most advanced and outstanding wiring method.

Only the non-metallic way has a record of nearly fifty years for safe, economical, durable service. Ask your friendly Electrical Inspector about the safety and long-life features of knob-and-tube wiring. Write for wiring manual.



PORCELAIN PRODUCTS, Inc.
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Wire Today for Tomorrow's Load

He's making an

ACCURATE INSTANT READING *of* **INSULATION RESISTANCE**



—NOT DELAYED BY CRANKING UP WITH A HAND-CRANKED GENERATOR



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Model 201 Vibrotest Range O-200 Megohms at 500 volts potential O-2000 Ohms, 150-300-600 Volts AC or DC. One of 36 models.

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Power source produces constant potential of 500 volts.

NO CRANKING.

NO LEVELING.

ONE-HAND operation, level or at practically any angle.

EASILY READ scale shows ohms and megohms.

SEVERAL COMBINATIONS of AC and DC voltages available.

COMPACTLY CASED, easily portable.

Ideal tester for quick dependable time-saving testing by electrical contractors, maintenance superintendents, and others responsible for protection of equipment. One of 36 Vibrotest models for every requirement.

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Associated Research also makes HYPOT, all-purpose insulation breakdown tester, VIBRO-GROUND, ground resistance tester, and many others. Full facilities for repair of electrical instruments.

Engineering Service Representatives in all Principal Cities.

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with 4,025 Duluth families are homes newly built or purchased from others, at an average cost of $4,427 and a total expenditure of $17,718,675. Repairs to present homes is indicated by a $2,028,940 volume.

A pessimistic note to the glowing postwar home market prospects was added by a Minnesota Poll survey which "indicates a price bottleneck might well be a serious factor in the postwar building and construction program . . . one which might jeopardize the entire structure, not only in this state but in the nation."

The survey revealed that while 132,000 Minnesota families are planning to build or buy a home within three years after the war, 39 percent of those interviewed will postpone their building plans if construction costs are up 25 percent as generally predicted by the trade. The cost question looms large in most people's minds, the report continues, and 24,800 families reported they plan to spend less than $3,000 on a house—a figure difficult to correlate with the size of house planned since a five-room war housing bungalow in Minneapolis cost about $6,000.

The report indicated that construction costs and the prospective builders' ideas of what they plan to spend are quite far out of line making it difficult to guarantee the amount of postwar home construction anticipated by the trade generally.

EFHA LIQUIDATED

Final liquidation of the Electric Home and Farm Authority, established as a companion to the Rural Electrification Administration to make available easy credit for home wiring and the purchase of electrical appliances, principally in rural areas, has been made, Federal Loan Administrator John W. Snyder has announced.

The liquidation came as the Reconstruction Finance Corporation paid the U. S. Treasury $1,560,000, which Mr. Synder said represents a net return to the



At Denver IAEI Luncheon. D. G. Mulligan, Denver, new chairman, Harold Rankin, and Mr. Merriweather, Public Service Co. of Colorado.

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Reflectors



• All time favorites . . . that's the way contractors feel about the MULTI line. They have good reason too—MULTI is complete—they can get the proper unit for any type of installation—maintenance is simple—no after worries. Here is your modern, flexible line of Reflectors that gives long-time service and better lighting.

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government of $710,000 over the $850,000 capital stock of EHFA.

The agency was dissolved in 1942 and its assets turned over to RFC for liquidation. Assets then totalled $8,229,000, and liabilities $6,685,000. Assets consisted principally of 133,000 installment contracts for wiring and appliances.

Altogether, the Authority assisted 7,100 small contractors and business concerns in 37 states. It purchased installment contracts of more than 383,000 householders. Aggregate value of the contracts was about $53,048,000. They averaged less than $150 apiece.

Book Review

ELECTRONIC TUBES

Engineers, designers and others who need a guide for selecting proper electronic tubes for industrial applications, will welcome this new 412-page industrial-tube manual. It is a technical manual on electronic tubes for industry, and has been prepared by the General Electric Company's Tube Division at Schenectady.

Popular applications of ignitrons, thyratrons, kenotrons, phanotrons, pliotrons, phototubes, glow tubes and ballast tubes are featured in this manual. Information is also furnished on vacuum gauges and vacuum switches. One section contains an interchangeability chart and socket information. It is profusely illustrated with photographs, outline drawings and performance curves.

The manual, which sells for two dollars, has an expander type binder and has been prepared in loose-leaf form with tabbed dividers. This makes it easy to add new data as it is made available. The new data which will be prepared for the manual from time to time can be furnished to purchasers of the manual for nominal annual charge of one dollar.

The size of this manual is 10¾ inches high, 9¼ inches wide and 2½ inches thick, with provision for expansion. Its title is "Electronic Tubes, Industrial Types", and it is published by the General Electric Company. Copies of the manual may be purchased by writing Electronics Department, 267-122, General Electric Company, Schenectady, New York.

MANUFACTURERS NEWS

WESTINGHOUSE CHANGES

The consolidation of the Westinghouse Electric Corporation advertising programs under direction of J. M. McKibbin, assistant to vice president, including all general advertising, the radio programs, motion pictures and



ROYAL quality steadily goes up, so ROYAL products will never "let you down"! . . . and, normal delivery will soon be a reality.





ROYAL Crystal.. the original glass-top fuse



ROYAL

WIRE • CORD SETS • CARTRIDGE and PLUG FUSES • FUSTATS • TROUBLE LIGHTS • CHRISTMAS LIGHTING SETS

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Millions
now in daily use

• **Always remember: Aerovox has made the major portion of those millions of motor-starting capacitors now in daily use. And Aerovox has kept faith with households everywhere, by making available wartime replacements so that indispensable refrigerators could be kept going for the duration, at least.**

Yes, for replacement purposes quite as well as initial equipment, it's Aerovox motor-starting capacitors first and last.

ARMY E NAVY

• Ask Our Jobber . . .

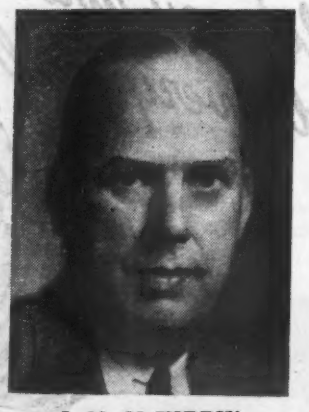
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sign identification work, has been announced. Mr. McKibbin has had charge of Company product and industry advertising since May 1944. Assignment of the additional advertising responsibilities to Mr. McKibbin places the entire Westinghouse program under his direction. His office will be in Pittsburgh.

Merger of the illuminating engineering department with the commercial engineering department of the Westinghouse Lamp Division was announced recently. D. W. Atwater, manager of the illuminating engineering department since 1942, will head the newly-consolidated departments as manager of commercial engineering. Ralph R. Brady, former manager of commercial engineering, has been appointed manager of electric discharge lamps sales. Mr. Brady will be responsible for unifying the Westinghouse effort in the sale and promotion of the entire family of electric discharge lamps except the Sterilamp bactericidal ultraviolet tube. Working out of the Lamp Division's headquarters plant at Bloomfield, N. J., Mr. Brady will coordinate with the Division's district managers throughout the nation.

The appointment of three men to key positions in the Lamp Division, Bloomfield, was announced recently by Ralph C. Stuart, vice president in charge of the Lamp and Lighting Divisions. Henry B. Ahlers was named an assistant on Mr. Stuart's staff; Dr. Albert Brann was named manager of the Division's specifications and standards department and Paul B.

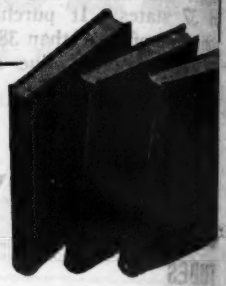


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510 illus.

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By J. M. Dodds

A THOROUGH reference handbook treatment of all phases of marine electrical work, with the exception of radio—electrical fundamentals and techniques, full details of installing, testing, repairing and maintenance. Numerous examples, formulas, tables, basic electrical principles and special problems on board ship and in the shipyard.

These books cover:

—essential principles of electricity and magnetism and characteristics of electrical circuits—machines and devices involved in distribution and generation of electrical power in shipyards and aboard ship.

—installing, adjusting and maintaining every sort of electrical equipment from relays and governors to switchboards, meters, and electrically-powered instruments.

—how to solve any electrical motor, crane, pump, lamp or other kind of electrical problem except radio which may occur on board ship.

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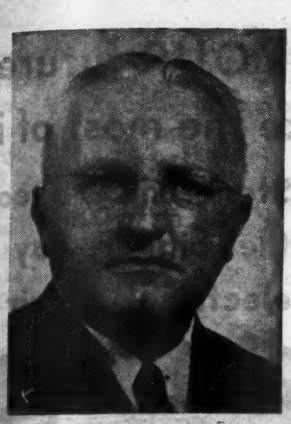
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R. R. Brady

Tully was appointed assistant manager of lamp manufacturing. All three will make their headquarters in Bloomfield.

Harvie L. Sykes, Jr., an illumination engineer for the Jersey Central Power and Light Company since 1940, has joined the Middle Atlantic District of the Lamp Division as district engineer.

Andrew H. Heywood has been appointed manager of the Motor Application Department of the Westinghouse Electric Corporation, East Pittsburgh, Pa.

H. B. Leidy has been named manager of the Middle Atlantic District Manufacturing and Repair Department of Westinghouse. R. J. Miller, who had been acting manager of the department, has been transferred to Emeryville, Calif., as assistant manager of the Pacific Coast District Manufacturing and Repair Department and H. E. MacArthur, formerly foreman of th Newark, N. J. M. & R. plants, has been made manager of the Huntington, W. Va. branch.

Acquisition of the B. F. Sturtevant Company, of Boston, Mass., the pioneer in the design and manufacture of air handling and processing equipment, has been announced by A. W. Robertson, chairman of the Westinghouse Electric Corporation. The Sturtevant Company becomes a wholly-owned Westinghouse subsidiary, operating as the B. F. Sturtevant Company, a Division of Westinghouse Electric.

W. H. WILLIAMS PRESIDENT OF CLARK CONTROLLER

At a recent meeting of the Board of Directors of The Clark Controller Company, W. H. Williams was elected president of the company. He had served for many years as vice president in charge of sales and for the past year as executive vice president and general manager.

With the late P. C. Clark, he was one of the founders of the company and has spent 35 years in the electrical control industry. He is a graduate in electrical engineering of Drexel Institute, Philadelphia, a member of the Association of Iron & Steel Engineers,



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WARREN, PENNSYLVANIA

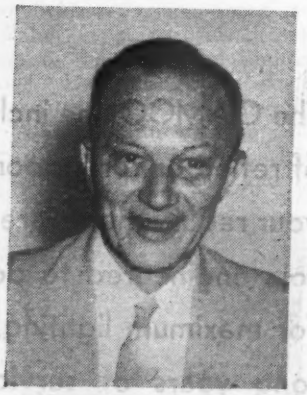


W. H. WILLIAMS

and is Chairman of the Advisory Committee of the Industrial Section of NEMA.

O. C. SCHMITT PRESIDENT OF EMERSON ELECTRIC

Oscar C. Schmitt was elected by the Board of Directors as president of The Emerson Electric Manufacturing Company, St. Louis. He succeeds W. Stuart Symington, who was appointed



OSCAR C. SCHMITT

by President Truman as Chairman of the Surplus Property Board.

Starting in a minor capacity in the advertising department of Emerson Electric in 1910, Mr. Schmitt has successively held almost every major post in advertising, sales promotion, sales and executive manager in the organization.

NATIONAL ELECTRIC PRODUCTS ANNOUNCEMENTS

The National Electric Products Corporation of Pittsburgh, has announced the return of two former employees from service with the Armed Forces.

Williams C. Robinson, Jr. has again assumed the vice presidency of the company after serving 18 months in the Pacific area as a Lieutenant in the U. S. Navy.

Dudley W. Rice has rejoined the

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Make the most of it!

Start now to earn the bigger pay in electrical repair



Was there ever such an opportunity to get started in electrical maintenance and repair—and at top-notch wages? Are you ready—with experience and ability—to cash in on it? Others are getting just the sort of background needed—quick! practical!—to handle the great variety of electrical maintenance and repair work TODAY—from this well-known electrical library. You can too!

Electrical Maintenance and Repair Library

5 volumes, 2042 pages, 1721 illustrations

Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generator units—to inspect and repair motor starters and generators—to diagnose motor and generator troubles—to figure new windings for old cores, DC and AC windings—to test armature windings, test induction motors, etc., etc. The new book is full of trouble-shooting charts that show quickly symptoms, causes, specific remedies, etc.

Includes trouble - shooting book

Now in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book giving helpful maintenance information, special trouble-shooting charts, explanations of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly paymments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

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Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

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Position .....E.C. 9-45

organization as manager of the Surface Raceway Department. For several years Mr. Rice was a Captain in the Army Air Forces.

George C. Richards has been appointed Eastern District sales manager and G. D. Wells now represents the company in Baltimore, Md. Mr. Richards, formerly a licensor's agent, will make his headquarters at 9 Rockefeller Center, New York. Mr. Wells was previously associated with the Westinghouse Electric Corp.

Walter J. Barnes has been appointed Southern District sales manager. He will make his headquarters at 168 Walton St., Atlanta, Ga.

SANGAMO ELECTRIC APPOINTMENTS

Sangamo Electric Company of Springfield, Illinois, announces the appointment of James H. Patton as sales manager of the Utilities and Industrial Division, and L. Dana Johnson as sales promotion manager.

Mr. Patton was, for many years, southeastern district manager, prior to that having had similar positions in the Mid-



J. H. PATTON

dlewest and Southwest territories. Upon Sangamo's entry into the war effort, Mr. Patton was recalled to the factory to assume responsibility for the production of confidential Naval apparatus. He will continue in this capacity until late Fall, when he will take on his new duties.

OKONITE COMPANY CHANGES

E. J. Garrigan, formerly vice president and Factory sales manager, has been appointed vice president in charge of sales and will be responsible for directing all sales activities of The Okonite Company and its Hazard Insulated Wire Works Division, as well as those of its affiliate, The Okonite-Callender Cable Co., Inc. Mr. Garrigan will be located at the Company's executive offices in Passaic, N. J.

C. E. Brown, Jr., formerly vice president in charge of the Company's Washington, D. C. office has been ap-

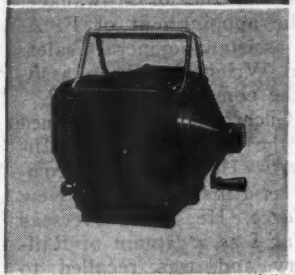
WHICH "MEGGER" INSULATION TESTER is Best for You?

THE "Megger" line of instruments for testing electrical insulation is complete for ranges from a fraction of an ohm to 10,000 megohms, between which limits practically every insulation resistance measuring requirement falls. There are specific instruments for specific requirements and other types for more general use. Some users find one instrument suitable for all work, while others have use for several types.

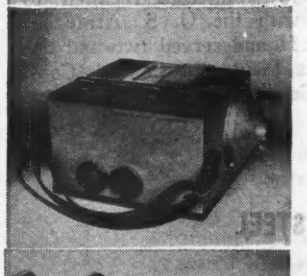
If you are uncertain which type and range of "Megger" instrument is best for your particular needs, write us, telling the type, size and rating of your equipment. We will gladly make recommendations. Write also for *Pocket Manual of "Megger" Practice*, No. 1420-*EC*.



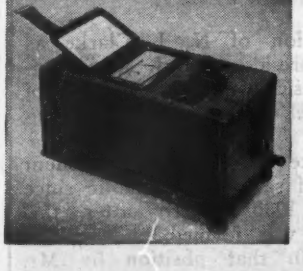
The New U. S.-Made Midget "Megger" Tester—*In many ways the most remarkable "Megger" instrument ever built. Weighs only 3 lbs—will fit an overcoat pocket or tool kit. Reads up to 50 megohms. Generates 500 volts and is always ready for use anywhere because of the hand crank. Bulletin 1785-EC.*



The U. S.-Made "Megger" Insulation Tester—*Contains the usual "Megger" direct-reading true ohmmeter, of the permanent magnet moving coil type, mounted with a d-c hand generator in a plastic molded case. Ranges up to 2000 megohms, with hand generators up to 1000 volts. Widely used in hard service. Variable-pressure ("Meg") and constant-pressure ("Super-Meg") types. Bulletin 1735-EC.*



The "Bridge-Meg" Resistance Tester—*This instrument is a combined "Megger" Insulation Tester and a four-dial, multi-ratio Wheatstone Bridge. Will measure any ohmic resistance from .01 ohm up to 100 or 200 megohms; hand generators rated up to 1000 volts. A complete and compact unit that is ideal for power companies and industrial plants. Catalog 1685-EC.*



High-Range "Megger" Testing Set—*The original heavy-duty type "Megger" Testing Instrument. Made in all ratings up to 10,000 megohms and 2500 volts. A combination high-potential testing and insulation resistance measuring set. Hand- and motor-driven types. Catalog 1685-EC.*

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Blo-Fan

CEILING VENTILATORS!

YOU can be certain that home owners will insist upon cleaner, healthier, more liveable homes! Unwanted fumes and odors must be eliminated *at the source*—before they can spread.

Blo-Fan

"SPOT" VENTILATORS

installed in the ceiling—directly over the origin of these vapors—get rid of them as they rise—before they spread or soil walls and furnishings.

Blo-Fan combines the principles of fan and blower. It's twice as effective as a sidewall fan of equal size across the room.

Be prepared to cash-in on Blo-Fan ceiling ventilation.

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1245 E. 33rd ST. • LOS ANGELES 54
BRANCHES (TO BE REESTABLISHED AFTER THE WAR)
SAN FRANCISCO • SEATTLE • CHICAGO • NEW YORK

pointed vice president and general sales manager to coordinate the activities of the executive offices in Passaic, N. J. with the Company's 18 branch offices. Mr. Brown will also take over the duties performed by the late W. K. Vanderpoel in acting as a contact executive between the officials of the power and light utilities and Okonite's utility specialists in branch offices. He will have offices at Passaic, N. J. as well as in the New York district sales office at 501 Fifth Avenue.

SYLVANIA ELECTRIC CHANGES

The Lighting Division of Sylvania Electric Products Inc. has announced that George R. Sommers has been named Pacific Coast sales manager with headquarters at San Francisco, Calif. Joining the New England Sales Division in 1940, Mr. Sommers moved to Washington D. C. early in 1943 where he served as manager of the Capitol Division until his appointment to the West coast post.

G. Dallas Rand, formerly assistant division manager of lighting products has been appointed Capitol Division manager to succeed Mr. Sommers.

CUTLER-HAMMER APPOINTMENTS

Cutler-Hammer, Inc. of Milwaukee, announces the appointment of F. A. Wright as assistant general sales manager. Mr. Wright has been associated with the company since 1927.

Fred W. Gilchrist has been named manager of the branch office in Indianapolis, Ind. He joined the company in 1919 as a member of the New York sales force. He served overseas in World War I as a captain of Railroad Artillery and was recalled to active duty with the U. S. Army for World War II and served two and one half years as Lieutenant Colonel, Coast Artillery Corps, 8th Service Command.

REPUBLIC STEEL ELECTIONS

The election of N. J. Clarke as senior vice president and J. M. Schlendorf vice president in charge of Sales of Republic Steel Corporation has been announced.

Mr. Clarke has been vice-president in charge of sales for Republic since September 1930, shortly after the corporation was formed, and will be succeeded in that position by Mr. Schlendorf who has been assistant vice president in charge of sales.

How to select • operate • maintain the *right* controllers for your electric motor power

Here is your controller guide for selecting and using the control apparatus that will best harness your electric motor power to your load requirements. This book takes the guess-work out of control purchase and presents the operator with all the facts on controller operation and design. Hundreds of diagrams, illustrations, curve charts and tables, together with a simple, direct text, instruct operating men, engineers, purchasers of control on each detail of proper selection, operation and maintenance.

Just Published!

CONTROLLERS FOR ELECTRIC MOTORS



By HENRY DUVALL JAMES
Consulting Engineer, Pittsburgh, Pa.
and LOUIS EDWIN MARKLE
Design Engineer
324 pages, 6½ x 9¼, 276 figures, 6 tables, $3.50

This book brings you up to date on the latest control apparatus—new uses of the electron tube, magnetic contactors, time-limit method of acceleration, development of plugging control, and of the Regulex, Ampledyne and Rotorol, and new types of time-delay overload relays. Here is analysis of popular commercial types, and most successful methods of accelerating motors, speed control, mechanical and dynamic braking, regeneration, and voltage control for d-c motors, with special sections on protective devices, national codes, installation and maintenance, and future control developments.

Detailed information on:
Functions, types, advantages and limitations of magnetic contactors
De-ion principle of arc rupturing
Use of two power tubes to give more uniform d-c power
Time-limit methods of accelerating motors
Motor-generator control of motor voltage
New types of time-delay overload relays

• There is a section on how to read controller diagrams, and a section devoted to future control developments describes new developments from World War II, electron-tube control, variable frequency, hydraulic gear, the use of telephone devices and practice, radio signals, etc.

See it 10 days • Send this coupon

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Send me James and Markle's Controllers for Electric Motors for 10 days' examination on approval. In 10 days I will send $3.50, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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TRUMBULL APPOINTMENTS

Frank M. Oglee has been appointed district manager of the Atlantic District for the Trumbull Electric Mfg. Co., which now includes Maryland, Virginia and the District of Columbia, other than Government.

Frank E. Cline has joined the ranks of salesmen for the state of Virginia, with headquarters in Norfolk, Va.

William J. Batchler has been relieved of his assignment as district manager for Virginia, Maryland, the District of Columbia, and has been appointed as Director of Government Sales.

George L. Stout has been appointed district manager of a new East Central District, with headquarters at the Trumbull Factory in Norwood, Ohio. Mr. Stout was formerly district manager located in Cleveland, Ohio, which will be included in the new territory.

•

Cannon Electric Development Co. of Los Angeles, Calif. has named H. M. Linter & Son, 50 Warren Street, New York as representative for Schedule "B" and "C" products in a portion of New York State, Connecticut and New Jersey.

Covering the sames schedules, Hart and Kugler, Park Square Building, Boston, Mass. have been appointed for the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and a portion of Connecticut.

Representatives Lewis & Sachs in New York and Ray Perron & Company in Boston, still represent the company's Schedule "A" products in their respective territories.

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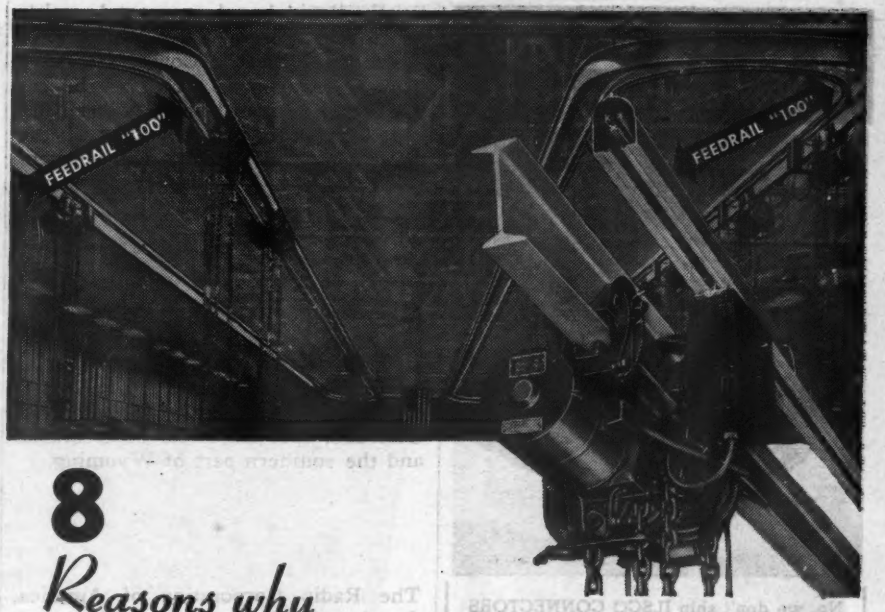
The Mitchell Manufacturing Co. has appointed James V. Gaynor as sales representative on industrial, commercial and residential lighting equipment for the Minneapolis territory. This includes the states of Minnesota, Iowa, North Dakota, the upper peninsula of Michigan and western Wisconsin. His headquarters are located at 2510 Wayzata Blvd., Minneapolis.

•

Allis-Chalmers Mfg. Co., Milwaukee, has named Robert V. Lackner as field engineer for the Pittsburgh district office. Mr. Lackner was formerly with the Carnegie-Illinois Steel Corporation at its Duquesne Works.

•

Ward Leonard Electric Co., Mount Vernon, N. Y. announces the appointment of Wright Engineering Company, 5620 North Meridian Street, Indianapolis, as sales representative in Southern Indiana, Southwestern Ohio and Kentucky.



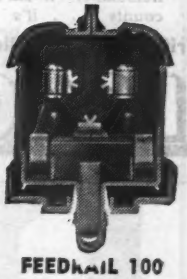
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ELECTRIC FEEDRAIL

Saves and Serves

1 *Electrification* for hoists and cranes in units ready for installation, no field engineering required, just bolt standard sections together.


FEEDRAIL 100

2 *Safety* and *protection* to workmen is assured by the steel enclosure that covers the live bus bars. Recommended by leading safety engineers.

3 *Saves space* over open-wire systems. Feedrail may be run close to pipes, girders or other members without danger.

4 *Two capacities* — Feedrail "60" for 60 Amps. 250 Volts A.C. D.C.; Feedrail "100" for 100 Amps. 250 Volts D.C., 575 Volts A.C.

5 Each section carries the Underwriters' Label, an assurance of dependable construction.

6 *Cold formed copper bus bars* and silver alloy contacts; self lubricating bearings eliminate wear.

7 Construction and support of bus bars allows for thermal expansion and contraction.

8 *Engineering service* yours for the asking—get the benefit of our years of experience.

Ask for Feedrail Catalog No. 15.

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company

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Electrical Connectors



No, we don't ship ILSCO CONNECTORS in fancy jewel cases. Nor do we make them from castings which are heavy, costly and of poor conductivity when compared to the pure 99.99% electrolytic copper of 100% conductivity used in all ILSCO CONNECTORS.

Remember—it isn't weight that counts . . . it's conductivity!

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ILSCO COPPER TUBE & PRODUCTS, Inc.
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150 DIAGRAMS and HOW TO READ THEM

150 DIAGRAM BOOK FREE

For Examining My New 7 Volume Set on

ELECTRICITY

HERE'S a valuable book of 150 Electrical and Radio wiring diagrams with charts and instructions. Practical information you need to win security and promotion. It's yours FREE merely for examining my 7-Volume Set on **Applied Practical Electricity** on 7-day's free trial. This 7-Volume Set COVERS EVERYTHING ELECTRICAL from HOUSE WIRING to ADVANCED AC-DC MOTORS and EQUIPMENT. Thousands of diagrams and photos . . . written so both "beginners" and "old-timers" can easily understand.

7-DAY'S FREE TRIAL I want to send you the 7-volume set AT MY RISK, postpaid, for 7-day's FREE examination. I'll also send you the FREE book of 150 Shop Prints which you are to keep as my gift **regardless of whether or not you return the 7-book set.** (No salesman will call.)

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FREE COUPON | *NOT AN ORDER—JUST A REQUEST TO SEE BOOKS*

H. C. Lewis, Pres., Coyne Electrical School, Dept. 65-E2, 500 S. PAULINA STREET, CHICAGO 12, ILLINOIS

Send me the new 7-volume set "Practical Electricity." Also send the book of 150 Shop Prints which is a FREE gift to me *regardless of whether or not I keep the 7-volume set.* I'll either return the 7-book set in 7 days and keep the 150 Shop Prints book as a gift from you and owe you nothing; or pay $5 within 7 days and $5 a month until $21 is paid, or I'll send the cash price of $19.75. One year FREE Consultation Service and Technical Bulletins included.

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☐ Check here if you want to save $1.25 by paying the postman the cash price of $19.75 on delivery. Same 7-day's examination and Money-Back Guarantee.

L. E. Pettit has been named assistant to the general sales manager of the **General Electric Company's** Electronics Department. He will be responsible for coordinating advertising and sales promotion activities of the department. Mr. Pettit's headquarters will be at the G-E Bridgeport, Conn., plant.

•

Allen-Bradley Company, Milwaukee, has appointed C. D. Belt and Company, 1530-16th Street, Denver, Col. as district representative. The Belt organization will cover the state of Colorado, the panhandle of Nebraska and the southern part of Wyoming.

•

The Radio Corporation of America, Camden, N. J. has announced the appointment of Harold C. Vance as manager of the Direct Sales Department of the RCA Tube Division. Mr. Vance will supervise the sales of all tube types to commercial broadcasters, air lines, police, educational institutions, and industrial users.

•

Greenlee Tool Co., Rockford, Ill. has announced the appointment of Philip E. Chappel as factory representative for the territory previously covered by Charles L. Clark, who has retired from field work to assume duties at the home office. Mr. Chappel works out of the home office, covering the territory extending from Lake Superior to the Gulf of Mexico and from Rockford to Denver.

•

The Copperweld Steel Company of Glassport, Pa. has named Harry J. Billica as Pacific District manager. He will make his headquarters in the Rialto Building, San Francisco.

•

Electric Air Heater Co. of Mishawaka, Ind., makers of Electromode Electric Unit Heaters has recently announced change of name to **Electromode Corporation.**

•

North American Philips Company, Inc., New York, has appointed Louis J. Chatten as vice president and general commercial manager. Mr. Chatten resigned on July 31 as Director of the Radio and Radar Division of the War Production Board in Washington.

WHERE TO BUY

LAMP ANNUNCIATORS

Kirkland Bulls-I-Units are ideal for building lamp annunciators. Just provide the proper size holes in the panel, then insert the Kirkland units and lock into place. Assembly is then ready for installation. Connect incoming wires and place in service.



Write for Catalogue

THE H. R. KIRKLAND CO., MORRISTOWN, N.J.

TORK



TURN ANYTHING ELECTRICAL ON & OFF REGULARLY

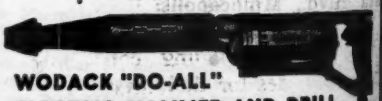
The TORK CLOCK CO., Inc.
MOUNT VERNON, NEW YORK

ALLEN FLUX

for SODERING
Silver Sodering
WELDING

L. B. ALLEN CO., INC.
6715 Bryn Mawr Chicago, 31, Ill.

DRILL CONCRETE THE EASY WAY



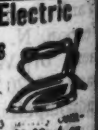
WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and labor installing expansion anchors. Two motions—reciprocal for hammer drilling—rotary for twist drilling. Drills masonry to 1⅝". dia., metal ⅜". Easy to maintain. Universal motor, runs direct from lamp socket. Weighs 15 lbs. Star drills in 17 diameters. Also chisels, bull points, etc. Ask for bulletin.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago 44, Ill.
Telephone AUstin 9888

Burned Out or Broken Electric Heating Elements





repaired with NICHROCITE PASTE. Simply overlap ends, apply paste, turn on current. Used by ..... companies, etc. Family size, $1.00, 4 oz. size $2.50. Satisfaction guaranteed.

ARMSTRONG Mfg. Co., Box 861F, Minneapolis, Minn.

Jurisdiction for Conversion

[FROM PAGE 91]

notify their employers that their ultimatum, to the effect that they would refuse to construct any building unless they performed all the work in its entirety, is to be held in abeyance pending conclusions of negotiations between the joint committee.

FOR BUILDING & CONSTR. TRADES DEPT.

Richard J. Gray, Vice-President
Robert Byron, Vice-President
Wm. E. Maloney, Vice-President

FOR UAW-CIO

C. H. Casebeer—CIO
Melvin Bishop, Int. Board Member
Joseph Hofman, UAW-CIO
Clinton Golden
D. W. Tracy

The CIO-AFL joint committee was formed and met in accordance with the request of the national heads of the Unions to affect a settlement of the dispute. The AFL submitted a proposal and the CIO a counter-proposal, both of which were rejected. The dispute was again sent back to Washington and is now in the hands of the National Committee for solution.

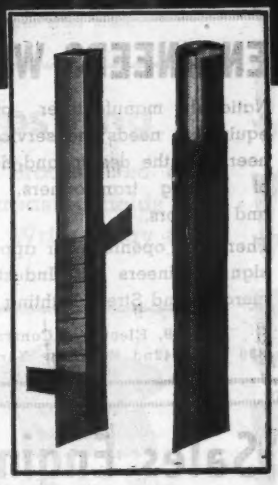
In the interim—to expedite reconversion work—the CIO and AFL temporarily agreed to go back to work; the CIO allowing AFL men on the jobs and the AFL getting as much of the work as possible. This is in effect until Washington issues a ruling. It's pretty much a day-to-day proposition now with both AFL and CIO men doing the machine work—more or less like each group sitting on kegs of dynamite that might go up any minute.

The CIO takes the stand that all machine work—including connecting up new machines for their first operation belongs to their maintenance workers. The AFL says the first connection of a machine, either new or old, for operation is part of the work the Building Trades should do.

As this is written the case is in the hands of the National Committee. On their decision and the acquiesence of both sides to its decision rests the problem of industrial peace in the Detroit area. And, unquestionably, the decision will set the pattern for the solution of similar jurisdictional problems in other industrial areas.

For Permanent PROTECTION Against High Heat





REWIRE WITH

DELTABESTON

Provide permanent protection in your plant by rewiring electrical equipment with Deltabeston Magnet Wire. Countless installations have proved that there's no better way to safeguard motors against high ambient temperatures and overload heat than rewiring with Deltabeston Asbestos-insulated and Deltaglass Magnet Wires. These wires are ideal for steel mills because the impregnated asbestos or varnished glass yarn insulation won't bake out in the hot operating conditions encountered in soaking pits, boiler rooms, furnaces and in other torrid zones. Both Deltabeston and Deltaglass are available in round, square and rectangular shapes covering a complete range of sizes.

TYPICAL USES FOR DELTABESTON AND DELTAGLASS MAGNET WIRES



ARMATURES
FIELD COILS
STATOR WINDINGS
MAGNETIC BRAKES
WELDING EQUIPMENT
LIFTING MAGNETS
INDUSTRIAL CONTROLS
SOLENOIDS

Do you have a magnet wiring problem where heat is essential? This catalog will help you. It's free! Write to Section Y954-8, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn. All Deltabeston Wires and Cables are distributed nationally by Graybar Electric Company, G-E Supply Corp., and other G-E Merchandise Distributors.

GENERAL ELECTRIC

SEARCHLIGHT SECTION

POSITIONS VACANT

MIDWEST BUILDING contractor has openings for electrical and mechanical engineers. Permanent post-war employment. Kindly give experience and salary required. P-346, Electrical Contracting, 520 N. Michigan Ave., Chicago 11, Ill.

SUPERINTENDENT FOR industrial electric motor repair shop, specializing in motor, generator, control and armature repair. Business located in South in fast growing industrial section town of 100,000. Prefer man with college degree and sufficient executive ability to work approximately 30 employees. Good position with profit sharing incentive for right man. Reply giving full particulars, experience, educational background and salary expected. P-351, Electrical Contracting, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRIC MOTOR Repairman—Firm operating small-motor shop wishes to expand in large motor field; has excellent opportunity for a man of at least 10 years experience on elevator armatures and 3-phase motors; must be first-class troubleshooter, able to wind anything himself and capable of instructing and managing others as department expands. Large motor shop is bright any airy and already fully equipped; has drive-in from street. We have an unusual opportunity for a first-class man who can stand investigation; no drinkers or drifters will be considered; job is permanent and pays good wages. Write fully giving your complete record in order to receive consideration. Electric Equipment Co., 2473 Sherman Ave., N.W., Washington 1, D. C.

REPRESENTATIVE WANTED

REPRESENTATIVE WANTED—that calls on the electrical jobber to sell our wire terminal loop former. Makes 10 perfect loops to one by hand. Every electrician should have one. Sells for less than $10. Wire Terminal Loop Former Co., 537 Caswell St., Belvidere, Illinois.

ENGINEERS WANTED

National manufacturer of lighting equipment needs the services of engineers for the design and development of lighting transformers, capacitors, and reactors.

There are openings for application design engineers on Industrial, Commercial, and Street Lighting equipment.

P-349, Electrical Contracting
330 West 42nd St., New York 18, N. Y.

Sales Engineers Wanted

Experienced electrical men, familiar with low voltage distribution systems to act as sales specialists in important District Offices on following: Panelboards, safety switches, enclosed circuit breakers, bus duct and load centers. Men accepted to receive full training at factory at company's expense before assignment. Write to Supervisor, Technical Employment, 306 Fourth Avenue, Pittsburgh, Pennsylvania, for application form.

WESTINGHOUSE ELECTRIC CORPORATION

WANTED
Electric Transmission Line
SUPERINTENDENT
Capable of taking full charge of construction of high voltage lines. Reply by letter giving full record of experience.
P-350, Electrical Contracting
520 N. Michigan Ave., Chicago 11, Ill.

DIRECT CURRENT POWER PLANT IN MANHATTAN

110-volt, 2-wire, 1200-KW Capacity

125-lb. Steam Operating Pressure—Non-Condensing.

ENGINE-GENERATOR UNITS

2—277-KW, 120-volt D. C. Westinghouse Generator, direct connected to 13½" x 18" Phoenix Engine.

2—185-KW, 120-volt D. C. Westinghouse Generator, direct connected to 16" x 15" Phoenix Engines.

1—217-KW, 120-volt D. C. Burke Generator, direct connected to 14½" x 19" Ames Uniflow Engine.

1—433-KW, 120-volt D. C. Burke Generator, direct connected to 20" x 22" Erie Ball & Valve Engine.
Complete with generating switchboard having air circuit breaker disconnects, ammeters, voltmeters, rheostats and totalizing watt-hour meter.

Plant now in operation—may be inspected.

Price available to qualified prospective purchasers.

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Ballpein Hammer
Plastic Screwdriver
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$19.85
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Dandy 8-piece set: CEETEE Pliers, Waterpump Pliers, Master-Ratchet Pipewrench, Needlenose Pliers, Crescent Wrench, Diagonal Cutters, Claw or Pein Hammer, Plastic Screwdriver.—$14.85. "Immediate Shipment." Overnight by Air to Anywhere—USA. Remit with order. Price List and Order Blank Free. Mail Now! If It's Tools: Remember—We have it. Can Get it or it isn't Made.
UNIVERSAL TOOL COMPANY
1827 Grand EC., Kansas City, Mo.

Theatre Lighting Techniques

[FROM PAGE 71]

fluorescent light sources has been the development of "germicidal" lamps, using the same lamp tube, fittings and method of production. These lamps emit radiation useful in destroying airborne bacteria. They will be used in lobbies, foyers, and auditoriums, and prove useful in making the theatre safer from the standpoint of health hazards. Filters for fluorescent lamps have also been developed, which screen out visible radiation and permit ultraviolet radiation only to be obtained. These, and other types of ultraviolet sources, are used to activate fluorescent dyes in rugs and decorations, or fluorescent paint in murals and light panels. Rugs which glow softly in the darkened auditorium will aid entrance and exit during the show. Murals, light panels, and special decorations will glow softly during picture presentation, adding a unique decorative touch, and providing a low intensity of light at the same time.

Luminaires and lighting equipment. The theatre makes use of practically all sizes, shapes and types of luminaires, lighting devices, and equipment.

Luminaires, ranging in design from utilitarian to purely decorative, are used to light mechanical and utility areas, lobbies, foyers, lounges, promenades, stairs, passageways, dressing rooms and auditoriums. In the main public areas luminaires are generally custom built for a specific theatre, in order to conform period design, wattage requirements, materials and finishes with those of the theatre. Suitable ornamental luminaire designs for theatres, incorporating the new "slimline" and "circline" lamps, have not yet been announced generally by fixture manufacturers. Some, however, are in a position to produce such fixtures as soon as materials and components are available.

Clever combinations of incandescent and new fluorescent light sources will result in an almost unlimited variety of ornamental and utility luminaire designs. In addition the new light sources, new metals and finishes, new plastics and new glassware are available. Application of these new materials is limited only by the designer's ingenuity.

Coves, soffits, large transilluminated areas, and light panels are usually lighted by either incandescent or fluorescent light sources attached to

wiring channels. Reflector equipment includes silver mirrored glass, polished and mat aluminum, porcelain and synthetic enameled steel, and white paint on steel or plaster. Priority restrictions on the manufacture and sale of such lighting equipment have been removed. Some manufacturers can furnish this equipment now, and others will be in a similar position upon the availability of materials and labor. Fluorescent lamps are well adapted to this type of lighting. They will permit greater natural diffusion of the light, with resulting evenly lighted elements.

Exposed transilluminated troughs and indirect troughs have heretofore been lighted with small wattage lamps. These small lamps have been used in order to achieve a degree of uniformity in lighting. Fluorescent lamps will now provide a new technique for obtaining smoothness of lighting and color blending in these lighting elements. These new lamps will also be used to create "lines of light", valuable in directing attention to a focal point, or in directing traffic flow from entrance to auditorium.

Other devices used in theatre lighting include built-in flush lens units, downlights, spot and floodlights. Also included are projectors, footlights, proscenium strips, border lights, balcony spot and floodlights, baby spotlights, exit lights, mural lighting strips, picture lighting reflectors, mirror lighting, floor and table lamps, lighted ornaments, illuminated wall niches, and "black light" equipment.

Lighting results. Artificial light forms the modern theatre's most important medium of expression. It is used for advertising, utility, decorative effect, safety and vision.

The theatre front must attract attention, tell a story, and stand out by contrast from other nearby attractions. It must be pleasing in design and create a favorable impression. Movement, sparkle, brightness, color—all can be combined through the medium of light to make the theatre front individual and attractive. It should be brilliantly illuminated, yet retain dignity.

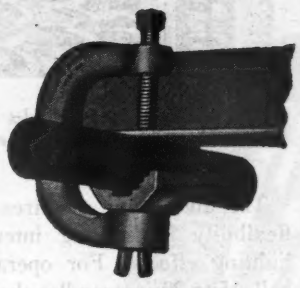
The lobby should maintain sparkle and glamour. An intensity of 15 to 20 footcandles in an outer lobby, with half this for an inner lobby, will aid in adapting vision between the brightly lighted entrance and a darkened interior.

The foyer lighting should not exceed three or four footcandles of subdued, uniform illumination. Large surface, low brightness illuminated panels or elements achieve the proper mood and lighting result in this area.

FULLMAN Latrobe PRODUCTS

FLOOR BOXES ★ WIRING SPECIALTIES

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE SUPREMACY LATROBE, PA.



No. 470 "Latrobe" Pipe or Conduit Hanger

Ever ready and sure grip for hanging pipe or conduit ½", ¾" and 1" to steel beams up to ⅜" thick.



No. 252-R Floor Box

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Be Ready for the Upswing

Reconversion is underway. Latrobe Products so essential in war production will find increasing fields of service in peace. Check stocks now. Write today for product and price list.



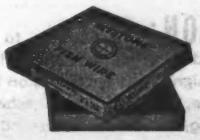
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Iron box body, 3½" round brass cover plate. No. 208 receptable and No. 207 bell Nozzle.



Bull Dog Insulator Support

Handy and effective for fastening porcelain or glass insulators to exposed steel framework.



Keystone Fish Wire

Fine quality flat steel wire properly tempered. Furnished in ten sizes.



No. 284 Nozzle with No. 200 Cover Plate

Duplex Receptacle Nozzle with ½" or ¾" brass pipe extension. Compact, neat in appearance.

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LATROBE . . . PENNSYLVANIA

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Synthite
#924-20
Clear Air-Drying
Varnish
FLEXIBILITY-ADHESION-RESISTANCE

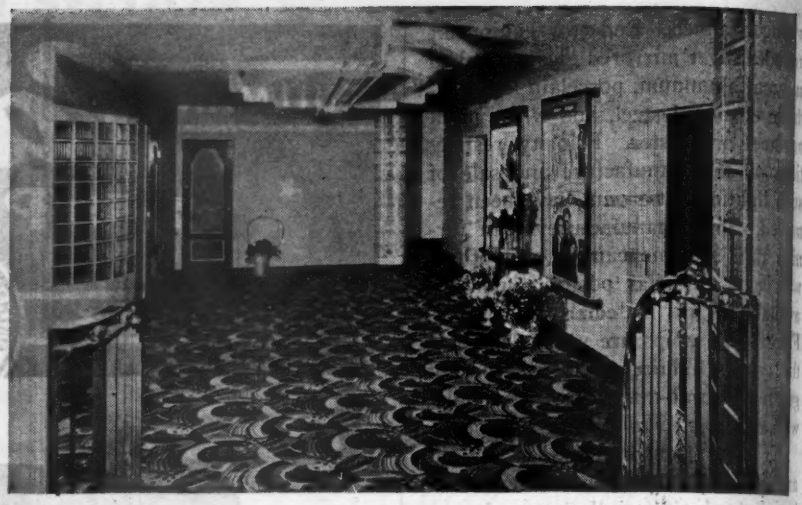
★ **FLEXIBILITY:** A prime factor contributing to the effectiveness of # 924-20 is the flexibility life. The following thermal shock test conducted according to government specifications conclusively proved this feature.

A copper strip, dipped in #924-20 and then air dried, was heated at a temperature of 85° C. for three hours. Next, the same strip was subjected to a temperature of minus 40° C. for three hours more. Allowing 1 hour recovery time, which made a complete cycle of 7 hours, the strip was then bent around a metal bar of a specified diameter. After the completion of five of these cycles, the film of # 924-20 had not lifted, and showed no signs of cracking.

★ **ADHESION:** In addition to possessing excellent bonding properties, SYNTHITE # 924-20 affords a high degree of adhesion to phenolic surfaces, mica, cambric, glass, asbestos, fibre board, sleeving, insulating paper and previously varnished surfaces.

★ **RESISTANCE:** The ability of SYNTHITE # 924-20 to resist the destructive action of oil and water was shown by the excellent results obtained in tests conducted by an independent laboratory. This varnish was found to successfully resist the corrosive action of salt spray, and actually surpass the requirements of various government specifications for oil resistance.

Insulating Varnish Specialists
Dolph's
JOHN C. DOLPH COMPANY
168 EMMETT ST., NEWARK 5, N. J.



Illuminated glass blocks in wall treatment, and two tier cove lighting from large center plaster ornament light this typical theatre lobby.

The auditorium requires maximum flexibility in lighting intensities and lighting effects. For opera or music hall, 15 to 20 footcandles should be provided, with provision for dimming or switching for lower intensities. Minimum intensities of approximately one-fifth footcandle should be obtainable. In the movie auditorium a maximum intensity of five footcandles is adequate. The same provision for dimming should also be made here. One-tenth footcandle at the front of the movie auditorium, graded to double this amount at the rear, will provide adequate illumination, while increasing the efficiency and effectiveness of picture projection from the screen.

Brightness relations. Where illumination intensities are high, the brightness of lighting units, panels or elements may safely be high. As the general level of intensities drop, brightness of the lighted units must drop proportionately. At the theatre entrance where 100 footcandles or more prevail, small wattage exposed lamps may be used safely. Inside the theatre, however, brightness in the lobby should not exceed 1000 footlamberts, or approximately one-half the brightness of an exposed 40 watt fluorescent lamp. This indicates that all light sources inside the theatre be concealed behind some type of diffusing media, except for light sources whose surface brightness is less than 1000 footlamberts. Maximum brightness of any lighting element in the movie auditorium should not exceed 50 footlamberts when the auditorium is darkened for picture presentation. In balconies, care should be taken to project the light downward and forward only.

Emergency lighting. Specific local ordnances usually require emergency lighting in all theatres. All exits should be plainly marked with an easily read exit sign. Those public areas normally lighted during a performance should be provided with lighting connected to an emergency circuit which will be turned



This mural, painted with fluorescent pigments, takes on new beauty in the darkened auditorium when exposed to ultraviolet (black light) radiation. Arrow points out one of the black light units. The glowing mural, or fluorescent-dyed rugs, provide ample light for safe entrance and egress during picture presentation.

Advertising in This Issue

on automatically in case of normal power failure.

Wiring. The theatre auditorium and stage should be wired for maximum flexibility in lighting result. Each color of light source, including white, should be on a separate circuit. Each lighting element should also have separate circuit control, if maximum flexibility is to be obtained. Each color circuit including white should be provided with dimmer control. Types of dimmers available are; resistance, auto-transformer, or Thyratron-reactor. Flasher control is usually employed for marquee or entrance lighting, to provide on-and-off, running, and spelling motions.

Producing color effects. Gaseous discharge lamps, including fluorescent, neon, and sodium vapor, can be used for producing color effects where dimming is not required. Fluorescent cold cathode lamps can be controlled in predetermined steps by use of proper transformer design and switching control to change current density in the lamps.

Murals, light panels, rugs and other objects which have been treated with fluorescent pigments or dyes, can be illuminated by exposure to any of the ultraviolet (black light) light sources.

Incandescent lamps in small wattages can be obtained in limited colors in natural colored glass, sprayed inside, and sprayed outside. These small lamps may also be dipped and sprayed in a wide variation of colors. Color caps and hoods, made of glass, are also available for many size lamps. Where reflectors are used with standard white lamps, colored glass roundels and plates are available for attaching to the reflectors. Gelatines in a wide range of colors are also available, which may be applied to reflectors by means of a metal color frame.

Where color effects are used daily, colored glass will be found more satisfactory, and in most cases, more economical, than the use of gelatines, or sprayed or dipped lamps. Colored fluorescent lamps produce color more efficiently than do incandescent lamps, and will no doubt be adapted for use in producing color effects extensively.

Paint finishes. In the case of indirect lighting, either from an entire ceiling, or from indirectly lighted panels, soffits and niches, the lighted surface should be finished in mat white, or very light tone. Glossy surfaces should not be used, as they will reflect the image of the light sources. A mat surface will provide complete diffusion, and produce a more uniform appearance of the lighted surface.

for today and for tomorrow.....

QUAD

Lighting UNITS



RLM Heavy Threaded Deep Bowl Reflector and Socket Hoods

RLM Threaded Dome Reflector

OVER 53% of all jobs done by contractors involve the installation of lighting fixtures. Make your share of these jobs pay you by installing QUAD units. They are modern, easily wired and installed, quickly detachable for cleaning, and highly flexible in design. All units are weatherproof and porcelain finish is permanent. You install them and your job is finished—result is more time for more jobs. For the proper unit for general or specialized installations — indoor or out — make your selection from the very complete QUAD line.

QUADRANGLE MFG. COMPANY

Mfgrs. of Incandescent and Fluorescent Lighting Equipment

32 SO. PEORIA ST. CHICAGO, ILL.

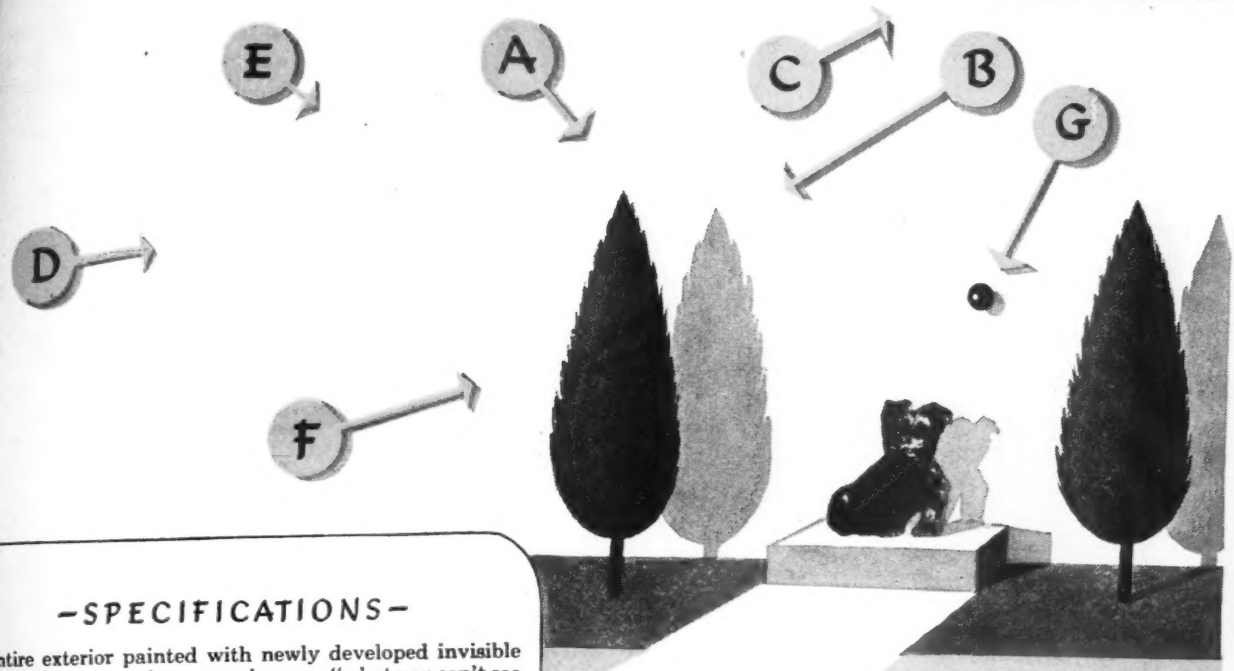
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*These companies have included Briefalogs, containing additional buying information on their products, in the 1945 Edition of the Electrical Buyers' Reference.

HERE IS A PICTURE OF TOMORROW'S HOME

(IF WE BELIEVE ALL THE PREDICTIONS WE READ)



–SPECIFICATIONS–

A Entire exterior painted with newly developed invisible paint. Eliminates maintenance because "what you can't see won't hurt you." Also reduces hazard of unexpected guests.

B Newly developed and super-automatic mail box. Opens and sorts mail, files bills alphabetically in special "future business" compartment, types answers to important correspondence and deposits completed letters on desk in den, ready for signature.

C Newly developed roofing with impregnated vitamin concentrates—eliminates all vitamin deficiencies. Can also be furnished with mosquito repellent, hay fever reducing hormones, and anti-asthma atomizer attachments. (Slight additional cost.)

D Newly developed, radio-activated, hydro-pneumatic gadget control. Can be adjusted, by simple dial setting, to do the following in sequence: (1) Ring alarm clock; (2) mix baby's formula; (3) prepare breakfast; (4) put the cat out; (5) wash dishes; (6) make the beds; (7) let the cat in; (8) change the linens, and (9) the baby.

E Newly developed heating, ventilating and refrigeration system—completely automatic. Provides temperature range from −30° to +120° F. Converts swimming pool to skating rink in 45 seconds.

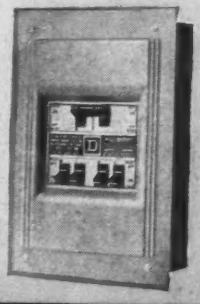
F Newly developed multiple-rotating partitioning—converts living room to library to kitchen to bathroom by simple electronic control. Ideal for invalids and inebriates.

G Newly developed visible doorknob. Serves as landmark in locating entrance to home. Turn of knob automatically cleans and polishes shoes, ejects dog from favorite chair, and tunes in news program.

ACTUALLY, we don't know what tomorrow's home is going to look like. We don't know where reality ends and fancy begins in projecting its future innovations. But we *do* know this—

People who build in the near future should provide for reserve electrical capacity to take care of the many appliances they'll want in the days and years ahead. Air-conditioning units, all-electric kitchens, deep-freeze cabinets, television, motor-powered work shops—eventually, they're going to want such electrical servants in their homes. If they don't provide enough circuits for them when they build, they'll have a major and costly re-wiring job on their hands, later.

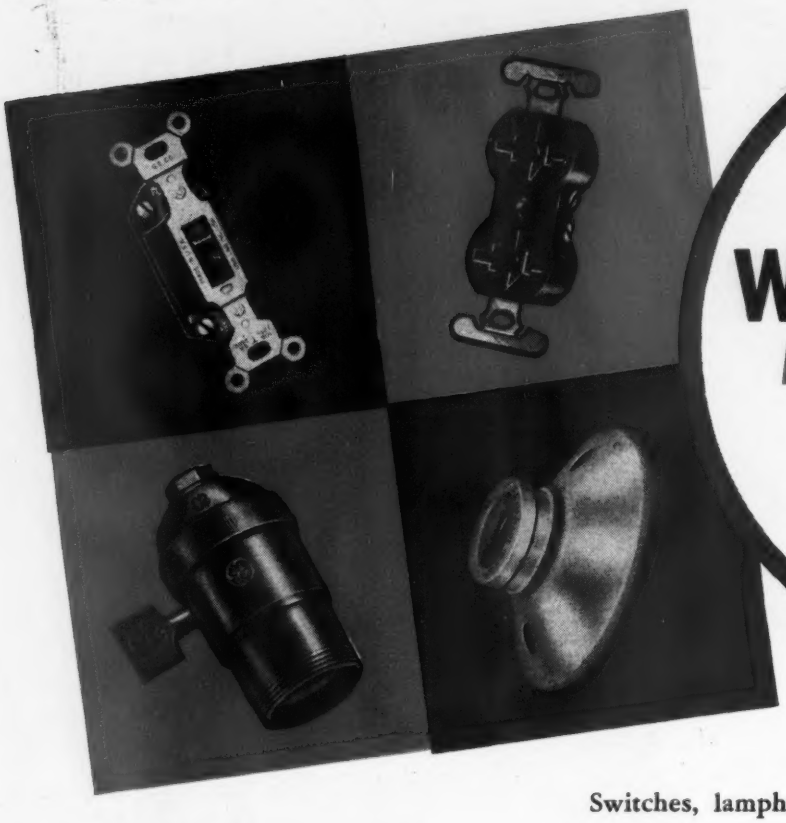
You'll be doing your clients a lasting service by showing them the advantages of full comfort wiring with spare circuits, combined with Multi-breaker convenience and protection. And you'll be money ahead through bigger and better wiring jobs.



the **MULTI-BREAKER** *eliminates fuses completely. When a short circuit or dangerous overload occurs, the circuit is cut off automatically. A simple movement of the lever restores current after the cause of the overload has been removed. There are no delays—nothing to replace.*

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES



G-E WIRING DEVICES

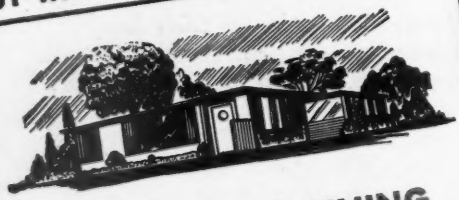
For New Wiring and Reconversion Wiring

FOR FURTHER INFORMATION on G-E wiring devices or building wire or conduits, see the nearest G-E Merchandise Distributor, or write to Section CDW953-8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

Switches, lampholders, convenience outlets, combination devices—all types of wiring devices are included in the G-E line. These devices are designed for easy installation and long service. They are carefully made and have high quality. They are neat appearing too. This is important, because wiring devices are the parts of wiring systems most frequently seen.

G-E Wiring Devices all during the war have been widely used for war-purpose installations. As this need slackens, these devices again will be available for wiring of all sorts. Plan now to use these superior devices for your industrial, commercial, residential or farm installations.

BUY WAR BONDS AND HOLD THEM



POSTWAR PLANNING

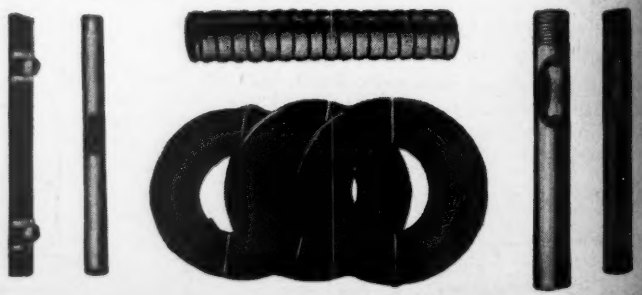
T. F. Flynn, Pres. of The Flynn Electric Co., electrical contractors, Bridgeport, Conn. says, "Postwar planning for the average American home should include adequate wiring. This is made necessary due to developments in home appliances, freezers, driers, blankets, air conditioning and heating equipment."

ADEQUATE WIRING — THE KEY TO THE HOME OF TOMORROW

G-E BUILDING WIRES AND CONDUITS

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GENERAL ELECTRIC

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